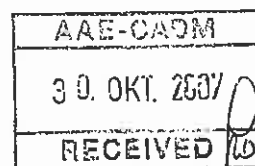


**CERTIFICATE OF CONFORMANCE**

<b>ORDER REFERENCE:</b>	Purchase Order Nr. 70423 dtd. 29.05.2007
<b>EQUIPMENT:</b>	RICH BOTTOM TH
<b>EQUIPMENT SPECIFICATION:</b>	MS-PRO-0597-AAE Issue4
<b>CI-No:</b>	
<b>MODEL / SN:</b>	PFM
<b>CLEANLINESS:</b>	The delivered hardware has been visually inspected and was found to be visibly clean at delivery from AAE
<b>REMARKS:</b>	



2.0 These undersigned certify that apart from the deviations noted in the "REMARKS" box, the delivered equipment as per attached documentation is in conformity with the Customer Requirements.

NAME:

FUNCTION:

SIGNATURE:

DATE:

Product Assurance

Project Manager

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**Document Change Log:**

Issue	Date	Modified Pages	Description
2.0	29 Okt 2007	II 3-2 3-7 3-12 4-2	Change Log added; Paragraphs in section 3 updated Paragraph 3.1 added Table added Lay-up added Blanket Inspection Sheet corrected

## **1. SHIPPING DOCUMENTS**

Delivered from:  
Ausgeliefert von:**Austrian Aerospace**  
Leobersdorfer Strasse 26,  
Industrieareal Obj.43  
2560 Berndorf, AUSTRIA  
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Mr. A. Potakowskyj**DELIVERY NOTE / PROFORMA INVOICE**  
**LIEFERSCHEIN / PROFORMA RECHNUNG****CERN Organisation Européenne**  
**pour la Recherche Nucléaire****F-01631 CERN Cedex**  
**FRANCE**

VAT-No:

Page / Seite: 1 / 2

Vienna, 05.09.2007

For the attention of:  
Zu Händen von: **DR. JOSEPH BURGER**  
Tel. No.:  
Tel. Nr.: **+41/22 767 5914**Our Reference No.: **RTML/LET/00002-07/AAE – RICH Bottom MLI**  
Unsere Referenz-Nr.:Int. Distrib.: **PAW, OLR,**  
Int. Verteller: **GRU,**

Item No.: Pos.Nr.:	Part – Description Artikel – Beschreibung	Dimension (mm) l x w x h Abmessungen (mm) l x b x h	Weight (kg) Gewicht (kg)	Quantity Menge	Unit Price (EUR) Einzelpreis (EUR)
1	<b>Aluminium Box (Coll 3019)</b>  <b>Contents – see Deliverable Items List (encl.)</b>	1192 x 790 x 517	-	1	14.000.--
				<b>Total Value Gesamtwert</b>	<b>14.000.--</b>

For Customs purposes only

Type of delivery : **DHL**  
Versandart :

2007-09-12

Accounting: 717 400

Delivery Conditions / Lieferkondition: **DDU Cem**  
Country of origin / Herkunftsland: **Austria**  
Function / Funktion:  
Value / Wert: **EUR 14.000.--**This Merchandise is delivered to a country of the  
European Union, Free of VAT, use of VAT No;  
our VAT Nr.: **ATU 15988304****RECEIVED THIS CONSIGNMENT IN GOOD ORDER:****LIEFERUNG ORDNUNGSGEMÄSS ERHALTEN:**

Date / Datum

Signature / Unterschrift

PLEASE RETURN A SIGNED COPY TO AUSTRIAN AEROSPACE NOT LATER THAN THREE DAYS AFTER SHIPMENT DAY.  
BITTE EMPFANGSBESTÄTIGUNG INNERHALB DREI TAGEN NACH LIEFERUNG AN AUSTRIAN AEROSPACE SCHICKEN**AUSTRIAN AEROSPACE** Gesellschaft M.B.H., Stachegasse 16, A-1120 Wien, Tel. int +43-1-80199-0  
Firmenbuch-Nummer: FN 91260g Handelsgericht Wien UID.Nr.: ATU 15988304

**DELIVERABLE ITEMS LIST****Thermal Hardware**

<i>Pcs.</i>	<i>Description</i>	<i>Drawing</i>	<i>SN</i>	<i>Remarks</i>
1	Blanket Rich Bottom XN	G4070-100-110-00/A	01	PFM
1	Blanket Rich Bottom XP	G4070-100-115-00/A	01	PFM

**Attachment Hardware**

<i>Pcs.</i>	<i>Description</i>	<i>Drawing</i>	<i>Colli</i>	<i>Remarks</i>
10	Stand-off Ø3-5	G300-409-000-00/A	3038	
10	Stand-off Ø3-8	G300-410-000-00/A	3036	
20	Clipwasher Ø3/ Ø11	SKQ-V10165/Rev.1	1470	
24	Velcro Hook 085		-	25x40mm

**Grounding Hardware**

<i>Pcs.</i>	<i>Description</i>	<i>Drawing</i>	<i>Colli</i>	<i>Remarks</i>
-	N/A			

**Spare Hardware**

<i>Pcs.</i>	<i>Description</i>	<i>Drawing</i>	<i>Colli</i>	<i>Remarks</i>
1	Stand-off Ø3-5	G300-409-000-00/A	3038	
1	Stand-off Ø3-8	G300-410-000-00/A	3036	
6	Clipwasher Ø3/ Ø11	SKQ-V10165/Rev.1	1470	
3	Velcro Hook 085		-	25x40mm

**Miscellaneous Hardware**

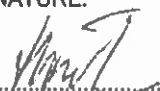

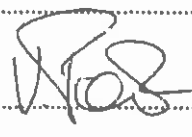
<i>Pcs.</i>	<i>Description</i>	<i>Drawing</i>	<i>Remarks</i>
1	Manufacturing Template	G4070-100-110-00/A	Polyester foil
1	Manufacturing Template	G4070-100-115-00/A	Polyester foil

## **2. HANDLING, PACKING & TRANSPORTATION PROCEDURE**

## THERMAL HARDWARE

### Handling Procedure for Thermal Hardware

DRL: -  
CI-No.: -

NAME:	FUNCTION:	SIGNATURE:	DATE:
Prepared: W. Hoidn	Engineering		18.4.00
Checked: C. Ranzenberger	Engineering		18.4.00
Approved: E. Precheilmacher	Project Management		18/04/2000

Document No: QSTD-MPRC-3031-AAE

Issue No: 1.0

Issue Date: 18 Apr 2000

DRL: -

CI-No: -

## **Distribution:**

Internal: RAN, STI, HOI, PRE (c)

External: -

**Number of pages of main document** (incl. cover pages, excl. annexes etc.): **11**

**Number of pages attached** (annexes etc.): -

## **Document Change Log:**

Issue	Date	Modified Pages	Description
1.0	18 Apr 2000		Initial Issue (supersedes PRC-OR-3735/Iss. 1)



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## 1. INTRODUCTION

### 1.1 SCOPE

This procedure is applicable for handling, packing and transport of Thermal blankets and foils and related small parts.

The Thermal Blankets are a very delicate hardware, have been manufactured to very high quality standards and represent a considerable value. Therefore these items must be treated with utmost care and packed when not in use.

During the processes described in this procedure attention must be paid to avoid the damages listed below:

- contamination (both particular and molecular)
- scratches on the surfaces/coatings
- mechanical damages in the foils/groundings

### 1.2 ACRONYMS

AAE.....	Austrian Aerospace Ges.m.b.H.
acc. ....	according
AD.....	Applicable Documents
ADP .....	Acceptance Data Package
AIV.....	Assembly, Integration, Verification
CIDL.....	Configuration Item Data List
e.g. ....	for example
etc. ....	and-so-on
i.e. ....	this means
IPA .....	Isopropylalcohol
MLI.....	Multi Layer Insulation
MRB.....	Material Review Board
N/A.....	Not Applicable
NCR.....	Non Conformance Report
NVR .....	Non Volatile Residue
ITO.....	Indium Tin Oxide
para. ....	paragraph
ppm.....	parts per million
PSA.....	Pressure Sensitive Adhesive
QA.....	Quality Assurance
RD .....	Reference Document
TBC .....	To Be Confirmed
TBD .....	To Be Defined
T/H.....	Thermal Hardware
VDA.....	Vacuum Deposited Aluminum

## **2. DOCUMENTS**

The following documents form part of this document to the extent specified here-in.

In the event of a conflict between this document and the Applicable Documents (AD), the AD shall have the precedence. In the event of a conflict between this document and a Reference Document (RD), this document shall have precedence.

Any such conflict should however be brought to the attention of AAE for resolution.

This document has been established based on the issues of ADs and RDs as given below. Issue changes of ADs and RDs will lead to an update of this document only in case of impacts on its content.

However, the valid documentation status is reflected in the relevant Configuration Item Data List (CIDL).

### **2.1 APPLICABLE DOCUMENTS**

none

### **2.2 REFERENCE DOCUMENTS**

RD1	PRC-OR-3706	Handhabungsvorschriften für Superisolationsmatten (Handling procedure for MLI; AAE internal procedure
-----	-------------	--

## **3. PRE-CONDITIONS**

### **3.1 PERSONNEL**

Handling and Packing of thermal blankets/foils and related hardware shall only be performed by experienced personnel or under supervision of experienced personnel. The cleanroom procedure of the relevant cleanroom must be followed, and the use of clean gloves as described in para. 3.3.1 is mandatory. The use of an appropriate face mask is recommended when handling cleanliness critical items.

### **3.2 ENVIRONMENTAL CONDITIONS**

Handling and Packing of thermal blankets and foils may only take place in cleanrooms which are compliant to the following requirements:

1. Cleanroom Class: better than 100.000 (acc. Fed. Std. 209E)
2. Relative Humidity: 50%  $\pm$  10%
3. Temperature: 22°C  $\pm$  3°C

### **3.3 MATERIALS AND EQUIPMENT**

In the para's. below the min. necessary materials/equipment are listed, which are required to carry out the processes described in para. 4 below:

#### **3.3.1 Handling Equipment**

As a minimum the personnel handling the MLI blankets have to wear:

- Protective, cleanroom approved clothing
- Gloves: clean lint free gloves or LATEX gloves must be used for handling of Thermal Hardware

## 3.3.2 Packing Materials and Equipment

For proper packing of thermal hardware the following materials have to be provided as a minimum:

- Inner Packing: Clear clean Mylar (Wrapping)
- Outer Packing: Polyethylene
- Tapes: Flashbreaker 1 Tape or equivalent
- Humidity indicator: Südchemie (Köln)  
No. 6685-12-194-4969  
range between 20% and 80% RH in steps of 10%
- Dessiccant

## **4. OPERATING INSTRUCTIONS**

### **4.1 HANDLING OF MLI**

The thermal hardware is of high engineering quality and costs and the repairability is limited. Replacement of damaged hardware is very expensive and hardly available in time. Therefore all thermal hardware is to be handled with care appropriate for space applications at any time.

#### **4.1.1 Handling Measures**

This para. describes all necessary measures to be taken into account in order to maintain the thermo-optical, electrical and mechanical properties of MLI within acceptable limits during all phases of handling.

##### **4.1.1.1 Thermal Blankets and Foils**

To prevent the sensitive surfaces from being scratched, the foils shall not glide one on another or on the table. By applying appropriate care, touching, rubbing or tearing of the blankets on equipment in the cleanroom is to be avoided.

Scratching or contamination of these coatings would have negative influence on the insulation properties and is therefore to be avoided.

Thermal blankets and foils (in particular 3-dimensional shaped ones) shall not be bent, folded or deformed unduely to protect the foils and their brittle coatings.

Never use extensive force (especially during integration).

In order to avoid electro-statical charging of the (external) surfaces, all electrically conductive layers/coatings are grounded to the structure using grounding leads.

The electrically conductive and invisible ITO-coating often used on the outermost Kapton-layer is a very thin and brittle film.

Scratching and folding of ITO-coated Kapton-layers as well as in-appropriate handling of the grounding leads would impair the electrical properties and has therefore to be avoided.

## **4.1.1.2 Bonding Leads**

Most thermal blankets and foils are equipped with bonding leads. For weight saving reasons those grounding leads as well as their attachment to the foils is susceptible to mechanical damage.

Therefore the thermal blanket is never to be picked up or held on the grounding leads. The grounding leads must not be unduely bent or folded.

In order to keep the grounding lead from being caught by cleanroom equipment, from touching the ground and from scratching the sensitive surfaces of the foils, it is rolled to a diameter of approx. 60 mm, when not being attached to the spacecraft.

## **4.1.1.3 Velcros**

Velcros are attachment elements consisting of a loop and a hook part. In order to avoid damage of the thermal hardware at velcro locations during removal from the spacecraft, the MLI must be held very close to the velcro which is being opened. Opened velcros can be covered with an appropriate (e.g. Mylar) foil, to avoid their re-connecting during opening of other velcros. Tearing on the MLI blanket edges only (with the force required to open all velcro connections) may result in tears in the MLI and is therefore not allowed.

## **4.1.2 Cleanliness**

The cleanliness of thermal hardware is essential for its function. Therefore these items are manufactured, integrated, checked and handled under clean conditions.

In case of contamination, the cleaning of perforated foils is only possible on small, local areas and using lint-free, soft cleanroom cloth with IPA. Due to the sensitivity of the coated, perforated foils, a general cleaning of MLI is not recommended.

The thermal blankets are to be protected against contamination by particles or fluids/greases. They may only be handled by personnel wearing gloves as specified in para. 3.3.1. If the gloves leave spots on the foils, they have to be replaced immediately by new ones.

All equipment (tables etc.), which come in direct contact with the foils, must be appropriately clean.

The relevant cleanroom procedure has to be followed.

## **4.2 PACKING INSTRUCTIONS**

### **4.2.1 Cleaning of Container**

*NOTE: Cleaning activities on the container must not start before all blankets are safely wrapped.*

Isopropanol alcohol is the selected cleaning medium for the container, both internally and externally. Lint-free cloth must be used.

Although the seal in the container rim is capable of coming into contact with the cleaning medium, it should not be saturated with such.

The container shall be located close to the airlock in a pre-cleaned environment and shall be cleaned thoroughly internally and externally.

*NOTE: The container must always be closed when no loading/unloading activity is in progress.*

After cleaning has been performed, washing of hands is obligatory, and the container should be left open for 5 minutes to allow for evaporation of cleaning agent.

### **4.2.2 Packing Materials**

It is generally possible to re-use the packing material; damaged packing foils must be replaced with new ones (for materials see para. 3.3).

Each thermal blanket is first wrapped in clear mylar. Then it is packed in a polyethylene outer bag.

The humidity indicator and desiccants (min. 6 units per m<sup>2</sup> polyethylene foil) are added and finally the polyethylene outer bag is sealed.

Each outer bag will be provided with a label at least containing the part number of the blankets included.



## 4.2.3 Packing and Unpacking of the Hardware

All thermal blankets and foils shall be packed in a reuseable container designed to provide sufficient protection of the thermal hardware.

Stacking of blankets is acceptable, if the foils are separated by spacer netting.

Blankets without spacer netting ("embossed" or "crinkled" foils) shall not be compressed to avoid flattening of the foils, which would reduce the thermal performance.

This type of MLI shall be separated by drawers or the polyethylene bag (used as outer packing of blankets) shall include a certain amount of air (compressed with a flat plate, there shall be a distance of 1 cm between the top of the MLI and the plate) to avoid compressing of the blankets due to stacking of the bags during transport and storage.

***NOTE:** A minimum bending diameter of 50 mm shall be ensured, if folding of blankets is necessary. Bending of ITO coated blankets shall be avoided whenever possible, because of the brittle coating.*

Before loading of the container, place a layer of polyethylene into the empty container such, that the polyethylene can be folded over the packed MLI blankets.

Once the last blanket has been loaded into the container, close the protective polyethylene and fix it with tape.

## 4.2.4 Storage

For short-term laying down of thermal blankets (i.e. storage time shorter than 1 working day) the relevant insulation item has to be put on a clean area and to be immediately covered by clean, clear mylar foils whenever not in use.

If the foreseen storage time exceeds the short-term period, the respective insulation item has to be packed in accordance with para. 4.2.3 and stored.

## 4.2.5 Inspection

Each time hardware items are placed into their respective protection bags, they should be visually inspected for any signs of damage.

## **3. GENERIC INTEGRATION PROCEDURE**



## Quality Standard

### Generic Integration Procedure for MLI Blankets and Foils

DRL: -  
CI-No.: -

NAME:	FUNCTION:	SIGNATURE:	DATE:
Prepared: C. Ranzenberger	Thermal Engineer		20/08/2006
Checked: A. Köksal	AIV & Facility Manager		28/9/06
Checked: A. Potakowskyj	Product Assurance		28/9/06
Authorized: J. Kornigg	Process Owner		11/10/06



Document No: QSTD-MPRC-3054-AAE

Issue No: 1.0

Issue Date: 26 Aug 2006

DRL: -

CI-No: -

**Distribution:**

Internal: Intranet

External: -

**Number of pages of main document** (incl. cover pages, excl. annexes etc.): **41****Number of pages attached** (annexes etc.): -**Document Change Log:**

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1.0	26 Aug 2006	all	Initial Issue

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## 1. INTRODUCTION

### 1.1 SCOPE

The scope of this document is to provide all necessary information needed for proper integration of MLI thermal blankets, foils and related small parts, which are to be manufactured, procured and delivered by AAE.

This procedure is applicable for all generic aspects of cleaning, repair and integration of MLI thermal blankets, foils and related small parts.

The relevant instructions for proper handling, packing and transport are described in AD1.

Instructions specific to a certain application/project will be provided separately in the relevant sections of the delivery documents using the forms defined in the annexes of this generic document.

### 1.2 THERMAL BLANKETS

The thermal blankets and foils are a very delicate hardware, have been manufactured to very high quality standards and represent a considerable value. Therefore these items must be treated with utmost care and packed when not in use.

During the processes described in this procedure attention must be paid to avoid the damages listed below:

- contamination (both particular and molecular)
- scratches on the surfaces/coatings
- mechanical damages in the foils/groundings

As the integration is performed in two major steps, the respective chapter is split up in two main parts.

- the first part describes the installation of attachments and bonding leads to the structure
- the second part describes the integration of the AAE MLI blankets to the structure





### 1.3 ACRONYMS

AAE	.. Austrian Aerospace GmbH
A/R	... as required
acc.	... according
AIV	... Assembly, Integration, Verification
CSL	... Configuration Status List
CFRP	... Carbon Fiber Reinforced Plastic
C/W	... Clip Washer
DC	... Direct Current
DIL	... Deliverable Items List
EOL	... End of Life
e.g.	... for example
etc.	... and so on
Fig.	... Figure
GN <sub>2</sub>	... Gaseous Nitrogen
HP	... Hewlett Packard
ICD	... Interface Control Document/Drawing
i.e.	... this is
IPA	... Isopropanol
K	... Kelvin
LN <sub>2</sub>	... Liquid Nitrogen
mil	... 0.001 Inches
MLI	... Multi Layer Insulation
NA	... not applicable
NCR	... Non-Conformance Report
NVR	... Non Volatile Residue
NRB	... Non-Conformance Review Board
PA	... Product Assurance
p.a.	... pro analyse
para.	... Paragraph
ppm	... Parts Per Million
PSA	... Pressure Sensitive Adhesive
QA	... Quality Assurance
RD	... Reference Document
ref	... reference
RH	... Relative Humidity
SGP	... Structural Grounding Point
S/O	... Stand-Off
TBC	... To be confirmed
TBD	... To be determined
TH	... Thermal Hardware
typ.	... typical
US	... Ultrasonic
UV	... Ultra Violet
VDA	... Vacuum Deposited Aluminium



## 2. DOCUMENTS

The following documents form part of this document to the extent specified here-in.

In the event of a conflict between this document and the Applicable Documents (AD), the AD shall have the precedence. In the event of a conflict between this document and a Reference Document (RD), this document shall have precedence.

All documents referenced hereafter as ADs and RDs are valid in their latest issue.

### 2.1 APPLICABLE DOCUMENTS

AD1	QSTD-QPRC-3031-AAE	Handling Procedure for Thermal Hardware
AD2	-	Cleanroom Regulation for the applicable Integration Facility

### 2.2 REFERENCE DOCUMENTS

RD1	EPOS	Process management system of AAE with all process documents integrated
RD2	QSTD-MPRC-3033-AAE	Vorschrift zur Superisolationsfertigung; Manufacturing Procedure for MLI (AAE internal procedure)
RD3	QSTD-MPRC-3014-AAE	Reinigung in der Hi-Rel Fertigung; Cleaning of parts (AAE internal procedure)
RD4	QSTD-QLST-4013-AAE	Checklist for Inspection of Thermal Hardware Blankets (AAE internal procedure)
RD5	QSTD-QPRC-2009-AAE	Non Conformance Reporting System (AAE internal procedure)
RD6	FED-STD-209E	Cleanroom and Work Station Requirements, Controlled Environment
RD7	ECSS Q-70-26A	Crimping of high-reliability electrical connections



### 3. RESPONSIBILITIES

The following responsibilities are defined (in accordance with AAE Integrated Management System - RD1):

*Note: Below responsibilities only apply if AAE personnel is performing the integration. In case that customer personnel performs the integration the customer responsibility rules shall apply.*

#### Design [B30] – Thermal Hardware System Ingenieur

- Definition of detailed integration instructions (see forms/examples in ANNEX A: )
- Definition of bonding instructions (see forms/examples in ANNEX B: )
- Definition of integration sign-off sheets (see forms/examples in ANNEX C: )
- Definition of any open work tasks (see forms/examples in ANNEX D: )
- Definition of hardware to be integrated (see forms/examples in ANNEX E: )

#### Manufacturing [B40] – Operator for Thermal Hardware

- Check for completeness & compilation of all hardware (acc. engineering) to be integrated
- Handling of hardware according applicable procedures
- Performing the integration of the thermal hardware attachments in accordance with this and other applicable procedures
- Performing the integration of the thermal hardware blankets & foils in accordance with this and other applicable procedures
- Generation of NCRs, if any
- Performing repair of the thermal hardware blankets & foils in accordance with this and other applicable procedures, if necessary
- Dokumentation of the performed integration by filling in the applicable sign-off sheets
- Dokumentation of any deviations from this procedure and accompanying definitions



#### 4. PRE-CONDITIONS

The following Pre-Conditions apply for all operations with Thermal Hardware. Therefore they are listed prior to the description of the actual procedures.

##### 4.1 PERSONNEL

The work described in this document shall only be performed by experienced personnel or at least under supervision of experienced personnel. The cleanroom procedures of the relevant cleanroom must be followed and the use of clean gloves as described in para. 4.4 is mandatory.

##### 4.2 APPLICABLE CLEANLINESS CONDITIONS

All operations have to be carried out in a cleanroom with at least class 8 acc. EN ISO 14644-1 (comparable to class 100.000 of RD6)

##### 4.3 APPLICABLE ENVIRONMENTAL CONDITIONS

For short term laying down blankets / foils which are not in use, sufficient horizontal areas (i.e. tables, boards, shelves etc.) shall be provided. In order to avoid scratches on external surfaces, those tables shall be covered by clean, clear Mylar foils or equivalent.

	required
Temperature:	22° C ± 3° C
Relative Humidity:	40 % + 60 %

**Table 4-1: Environmental Conditions**



#### 4.4 TOOLS AND EQUIPMENT

- Adhesive bonding Tools
- Disposable wipers or lint-free cloth: M-WipeTX502 or similar (organic contaminant content < 25 ppm)
- Isopropyl-alcohol or Acetone cleaning fluid: 'pro-analyse' quality or NVR < 2 ppm
- Cleanroom clothing (contaminated clothing is to be removed & laundered before re-use)
- Protective goggles
- Gloves: only clean lint-free gloves are allowed. Latex gloves are used during manufacture and their use is recommended. Use of gloves is however mandatory. Contaminated gloves must be replaced by new ones.
- Metal box (or other material not affected by adhesive mixture)
- Spatula for mixing and application of adhesive
- Tables in sufficient number and sizes with approved working surfaces
- Cleanroom approved marker pen
- Abrading equipment: Sandpaper 120, 360 or Scotchbrite
- Vacuum cleaner
- Hollow punch as shown in Figure 4-1;  $\varnothing$  TBD mm (A/R).
- Dry filtered  $\text{GN}_2$  (0,3  $\mu\text{m}$  filtered; technically clean)



Figure 4-1: Hollow punch (typ.)

#### 4.5 MATERIAL AND HARDWARE

- Structural adhesive systems according bonding instructions (see ANNEX B: )
- AAE delivered MLI blankets
- PSA Tapes (9460, 966, 9703) as needed according detailed instructions
- Other Tapes as needed according detailed instructions
- 1 mil Clear Clean Mylar
- Polyethylene (outer packing)
- Dessicant with humidity indication: DIN 55473
- Flashbreaker Tape or equivalent non-residual tape
- Structure samples for adhesive bonding samples



## 5. CLEANING

### 5.1 SAFETY CONSIDERATIONS

When using Isopropanol or Acetone as cleaning agent, it is essential that personnel follow the safety requirements of the suppliers safety data sheets exactly. Protective equipment (e.g. clothing, gloves etc.) must be used.

### 5.2 CLEANING PROCESSES

The cleaning of the delicate hardware has to be performed with utmost care. The relevant handling procedure (AD1) has to be followed.

Cleaning shall only take place in an environment as specified in para. 4.2.

Cleaning shall not degrade thermo-optical properties of the hardware and shall not cause scratches on the surface.

#### 5.2.1 Cleaning of Thermal Blankets and Foils

##### 5.2.1.1 Cleaning with Cleaning Solvent

Isopropanol as specified in para. 4.4 shall be used as cleaning solvent for cleaning of thermal blankets and foils.

*Note: Isopropanol must not be diluted with any other liquid.*

Cleaning of blankets/foils shall be done with use of a disposable wiper or lint-free cloth (as specified in para. 4.4) which is to be soaked and rinsed in Isopropanol prior to use.

Organic contaminants shall be removed by lightly touching the blanket/foil with firstly a soaked wiper and secondly a dry wiper. Care should be taken, that during the cleaning process no solvent excessively comes into the perforation holes of the foils.

*Note: Do not wipe contaminated area with excessive force, because this could cause scratches on the surface.*

The blanket/foil shall be allowed to stand for approx. 5 minutes to ensure full evaporation of the remaining solvent, before being re-used.



### 5.2.1.2 Cleaning with GN<sub>2</sub>

Finished blankets shall be checked for particulate contamination.

If seen necessary, particles shall be removed by means of a jet of compressed GN<sub>2</sub> and/or careful vacuuming.

*Note: Cleaning with jet of GN<sub>2</sub> must be employed with utmost care.*

The following pre-cautions have to be taken, if this cleaning method is selected:

- no unprotected blankets or other contamination sensitive hardware shall be located in the vicinity of the blanket to be cleaned, since contamination of these items may result
- only the outer surface shall be blasted with GN<sub>2</sub>; care shall be taken to avoid that the jet of compressed GN<sub>2</sub> effects the internal layers of the blanket
- avoid scratching of surface by dust during cleaning
- clean hardware only in one direction to avoid re-contamination of blanket

### 5.2.2 Cleaning of Bonding Leads

If bonding leads are contaminated, wipe them thoroughly with a disposable wiper soaked in Isopropanol.

*Note: As bonding leads of blankets often run near a perforated inner foil, care should be taken that no solvent excessively comes into the perforation holes of the foil.*

*Care should also be taken, that during the cleaning process no damage of the connection to the blanket itself occurs.*

### 5.2.3 Cleaning of Small Parts

Stand-offs, clip washers, grounding washers etc. have been cleaned before their delivery. If contamination occurs, a replacement shall be considered, as spare parts are available in most cases.

If cleaning of such parts is decided, these parts shall be cleaned by means of an ultrasonic cleaning bath (e.g. according to RD3 or similar procedure). This process has to be performed in a safe distance to blankets, foils, etc.

## 5.3 INSPECTION AND DOCUMENTATION

After performing cleaning, a visual inspection has to be performed to verify that visibly clean condition of the hardware has been achieved.

After delivery each cleaning process has to be recorded in the relevant Historical Record of the Blanket/Foil.



## 6. REPAIR

This chapter describes the necessary steps to be undertaken for repair in case of damaged thermal hardware. Information/criteria applicable for repair of MLI blankets in general as well as additional information for detailed repair methods are provided.

### 6.1 REPAIR CRITERIA

The following criteria are applicable for repair of MLI blankets:

- Whenever a damaged layer of a blanket/foil or a referred part (e.g. attachment provisions, electrical bonding provisions etc.) has to be repaired then only repair material shall be used, which consists of a material similar to that of the material being repaired.

*Note: Kapton tape (with or without coating pending damaged layer characteristics) can always be used for repair of a damaged layer (i.e. Kapton and Mylar foils).*

*Never use Mylar foils for repair of Kapton foils!!!*

- Kapton tape used for repair shall always be attached on non-space side if possible.

### 6.2 REPLACEMENT CRITERIA

In order to enable decision if a blanket can still be repaired or has to be re-manufactured, several criteria have to be taken into account.

In case of the following a blanket shall be re-manufactured

- Tears in a damaged outer layer exceed length of 150 mm.
- Holes in a damaged layer exceed  $\varnothing 20$  mm.
- Total area of repair material exceeds 10 % of total blanket area.
- One or more layers are damaged in such a way, that the required mechanical/thermal/electrical properties cannot be reached, and the respective layers cannot be replaced.
- Contamination level of blanket is that high, that required thermal/electrical properties cannot be reached and local repair or cleaning is impossible.
- Grounding point repair of grounding point is impossible.

*Note: Criteria listed above shall be understood as guideline for replacement of blanket/foil.*

*In general re-manufacturing is needed in all cases where unacceptable mechanical/thermal degradation can be expected or is possibly to be expected even after (mechanical) repair.*

*Final decision has always to be made via NRB.*





### 6.3 DETAILED REPAIR METHODS

In addition to the general procedures described above, this para. contains information about possible repair methods for damaged blankets, or referred parts.

#### 6.3.1 Tears in Blankets

Tears in blanket/foil are repaired as follows:

- Punch crackstopper hole (Ø3 mm) at end of tear.
- Clean application area of repair tape using Isopropyl-alcohol, if necessary (i.e. when area contaminated in a way that good adhesion of tape cannot be guaranteed).
- Close tear with repair tape.

Note: Overlap at end of tear shall be  $\geq 10$  mm.

*Repair tape only needed on one side (non-space side, if possible).*

- If a tear reaches a stand-off hole, the stand-off hole has to be reinforced with a ring of repair tape (in order to avoid punching of new stand-off hole).

#### 6.3.2 Holes in Blankets

Repair method shall be the same as described in para. 6.3.1 for the repair of tears.

Note: If hole exceeds Ø10 mm, it has to be repaired on both sides of the foil!

#### 6.3.3 Repair tapes

The following rules are applicable for the type of repair tape to be used.

Repaired foil	Repair tape to be used	Remark
foils of the inner package (thin Mylar or Kapton foils)	1 mil plain Kapton with PSA	
Outer layer (visible layer)	outer layer material with PSA	orientation of coatings (VDA, etc.) shall be the same as of the repaired foil.

#### 6.3.4 Contamination of Blanket

If a blanket/foil is contaminated, try to clean respective area as described in para.5.2.1.1 using Isopropyl-alcohol



### 6.3.5 Attachment Replacement

Attachments (Stand-offs, Clipwashers and Velcros) have to be replaced, if they are destroyed or damaged in a way that their mechanical performance cannot be guaranteed anymore

#### 6.3.5.1 Clip Washers

If the number of clip washer mounting/dismounting cycles exceeds 20, clip washers need to be re-inspected for proper performance in order to support the decision for further use.

In case that it cannot be ensured that the clipwashers mounting/dismounting cycles have not exceeded 20 cycles, at least a visual inspection on random samples is mandatory prior to launch/test.

#### 6.3.5.2 Velcros

If the number of velcro mounting/dismounting cycles exceeds 10, velcros need to be re-inspected for proper performance in order to support the decision for further use.

In case that it cannot be ensured that the velcro mounting/dismounting cycles have not exceeded 10 cycles, at least a visual inspection on random samples is mandatory prior to launch/test.

Velcros have to be replaced according to following repair method:

- Cut sewing yarn with scissor
- Remove Velcro
- Apply new velcro by using the same type and application procedure according to RD2.

### 6.3.6 Electrical Bonding

#### 6.3.6.1 Repair of Bonding Lead

If the bonding lead is damaged between the blanket/foil grounding point and the stress relief tape, a new grounding point has to be applied according to procedures described in the following para.

In any other case the bonding lead has to be cut off at the damaged location and a new connector/shrink sleeve has to be applied. The connector shall be crimped in accordance with RD7.



### 6.3.6.2 Repair of Grounding Points

Whenever a grounding point is damaged (i.e. damage of crimped connection between bonding lead and grounding point), a new grounding point has to be applied on the blanket.

If an additional grounding point has to be applied on a blanket, the following procedure has to be observed:

- Cut off bonding lead of damaged grounding point as close as possible to stress relief tape.
- Open tongues of outermost layer at new grounding point location to the minimum extent necessary for placing grounding washers.
- Open inner package of MLI
- Apply additional grounding point according RD2.
- Close tongues of outermost layer around grounding point.

*Note: For blankets carrying a betacloth outermost layer it has to be observed, that one of the grounding washers touches a graphite yarn of the betacloth*

*Note: Functional requirements of the new grounding point have to be measured and recorded in the relevant historical record – the measurement to be conducted shall be a pin-to-pin resistance measurement between different grounding leads of the same blanket. Acceptance of exceeding shall be decided on case by case basis via NCR. The requirement can be found in the blanket inspection sheets in the relevant delivery documentation.*

## 6.4 DOCUMENTATION

Each repair performed has to be covered by an NCR.

Each repair has to be recorded in the relevant Historical Record of the blanket with reference to the respective NCR. The amount of repair (e.g. length, % of total blanket area, etc.) has to be noted.

New mass of repaired blanket has to be recorded in the relevant inspection record of the blanket (i.e. column "Mass" respectively column "Remarks").

Historical Record of blanket shall support the decision, if a blanket can still be repaired or if it has to be re-manufactured (e.g. total amount of linear repair etc.).



## 7. INTEGRATION OF ATTACHMENTS

This part of the document describes how the MLI attachments (i.e. stand-offs, attachment supports, velcros) have to be installed to the structure.

### 7.1 SPECIAL PRE-CONDITIONS

Sufficient working space shall be made available to the working personnel. Where cleaning fluids are used, proper ventilation shall be ensured and water sources shall be within easy reach.

*Note: As described above, proper cleanroom clothing and approved gloves must be worn during the following steps of this process.*

### 7.2 BONDING OF STAND-OFFS

*Note: As there will most probably exist several types of stand-offs, a strict routine is necessary to avoid adhesion of a stand-off to an incorrect position*

To bond the stand-offs to the structure repeat the following paragraphs for all Stand-Offs.

*Note: For each batch of adhesive a bonding sample with stand-offs and a relevant structure sample is necessary. The samples and the remaining adhesive mixture shall be kept for traceability reasons.*

#### 7.2.1 Position Marking

The positions where stand-offs shall be adhered to must be marked on the structure. This is performed using an approved pen or very light abrading at the positions according to applicable drawings. Then the Stand-Offs can be bonded to these marked positions.

#### 7.2.2 Preparation of Stand-Offs

*Note: Open packages in the presence of QA personnell*

Open the package containing the stand-off type which is due for bonding. If supplied by AAE, Stand-offs have been cleaned prior to packing into the plastic bags according to RD3.

However, if cleaning is necessary due to any event proceed according to RD3 or equivalent.

If not already delivered in abraded conditions all Stand-Off flanges (bonding areas) have to be abraded with sandpaper as per para. 4.4 or equivalent.

*Note: A vacuum cleaner must be used, if abrading is performed in a clean area*



### 7.2.3 Substrate Preparation

Depending on the substrate, to which the stand-offs have to be bonded to, different procedures may be applicable. Roughening and subsequent cleaning has to be performed according to the relevant bonding instructions – see ANNEX B:

### 7.2.4 Adhesive Mixture

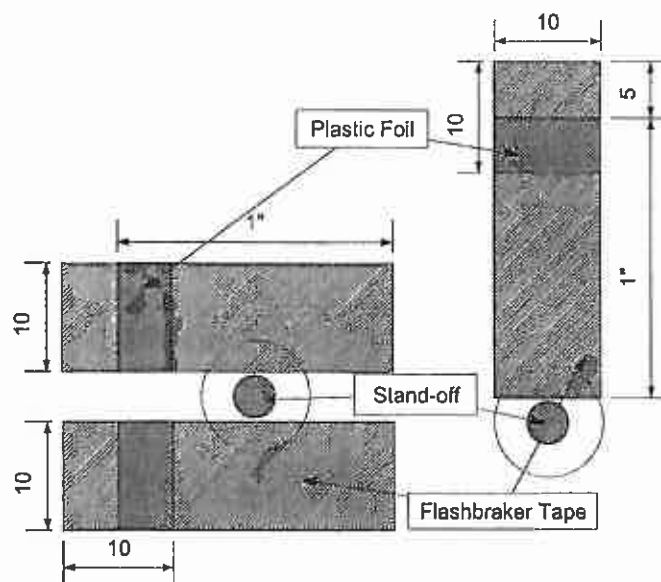
Depending on the adhesive to be used different mixture ratios, pot lives and curing times have to be observed. These parameters are defined in dedicated adhesive mixture records using the forms as described in ANNEX B: . For each batch of adhesive a separate adhesive mixture record has to be filled.

### 7.2.5 Application of adhesive and stand-off

Depending on the adhesive to be used different bonding procedures have to be used. The applicable procedures are defined via the relevant bonding instructions – see ANNEX B:

### 7.2.6 Fixation for Curing

Fix the stand-off with one or two pieces of flashbreaker tape or an equivalent non-residual tape as per Figure 7-1 over the foot.



**Figure 7-1: Fixation Tape for Stand-Off**



### 7.3 BONDING OF VELCROS

*Note: Each velcro attachment element consists of a loop part, which is already attached to the MLI blanket, and a hook part, which is to be bonded to the structure.*

To bond the velcros to the structure repeat the following paragraphs for all velcros

*Note: For each batch of adhesive a bonding sample with a velcro and a relevant structure sample is necessary. The samples shall be kept for traceability reasons.*

#### 7.3.1 Preparation of Velcros

Open the package containing the velcro hook tapes with the proper length.

The bonding area of each velcro hook part shall be cleaned with IPA, using a disposable wiper.

*Note: Prior to performing any bonding activity at least 10 minutes shall be waited to allow for evaporation of cleaning agent.*

#### 7.3.2 Position Marking & Masking

The positions where velcros shall be adhered to must be marked on the structure. This is performed using an approved pen or very light abrading at the positions according to applicable drawings. Then the Velcros can be bonded to these marked positions.

Those areas, where no adhesive is planned to be applied, shall be covered by flashbreaker tape or an equivalent non-residual tape.

#### 7.3.3 Substrate Preparation

Depending on the substrate, to which the stand-offs have to be bonded to, different procedures may be applicable. Roughening and subsequent cleaning has to be performed according to the relevant bonding instructions – see ANNEX B:

#### 7.3.4 Adhesive Mixture

Depending on the adhesive to be used different mixture ratios, pot lifes and curing times have to be observed. These parameters are defined in dedicated adhesive mixture records using the forms as described in ANNEX B: . For each batch of adhesive a separate adhesive mixture record has to be filled.

#### 7.3.5 Application of adhesive and Velcro

Depending on the adhesive to be used different bonding procedures have to be used. The applicable procedures are defined via the relevant bonding instructions – see ANNEX B:



## 8. INTEGRATION OF BLANKETS

### 8.1 GENERAL INSTRUCTIONS

#### 8.1.1 Pre-Conditions

A sufficient number of tables shall be available, such that all blankets can be laid out without undue deformation. These tables shall have a Teflon working surface or any other approved working surface. Clear clean Mylar shall be made readily available for covering of unpacked blankets. Any possible contamination source must be removed as far as particulate contamination as well as molecular contamination are concerned.

#### 8.1.2 Preparation of Working Surfaces

The tables on the working surfaces shall be visible clean. If necessary they shall be pre-cleaned using Isopropyl-alcohol cleaning fluid. Working surfaces shall not be severely scratched nor shall any part protrude out of the flat surface to avoid blanket damage.

#### 8.1.3 Blanket Identification

Each blanket carries its unique identification tag (Size: 38 mm x 24 mm). This tag is located on the backside of the blanket and looks as shown in the next figure:


 <b>Austrian Aerospace</b>			
Project	XXXXX		
Name	XXXXX		
Part.-No	XXXX	Issue	x
Doc.-No			
CI-No	XXXXXX	Model	x
Lay-up	XXXXXXX	S/N	xx

Figure 8-1: Marking Tag



#### 8.1.4 Marking of Stand-Off Holes on the Blanket

As the S/O's are mounted to the structure with tolerances and the blankets have to be adapted slightly to the actual shape of the structure, the S/O holes are not punched during manufacturing but during integration. The positions of the holes for the S/Os are marked up on each template corresponding to a blanket (i.e. carrying the same Part Number).

*Note. The template must be legible if put on the spacecraft (i.e. not mirrored).*

To obtain correct S/O positions on the template, attach the template to the spacecraft by hand at its intended location. If necessary shape the template to assume the optimum contour over the spacecraft and cross-check the marked-up S/O holes with the actual S/O positions. If necessary mark up the actual positions with the cleanroom approved pen.

#### 8.1.5 Installation of Structural Bonding Lead Parts

One Bonding Lead consists of two parts which are interconnected by means of a pin/socket connection. One part of this Bonding Lead is riveted to the blanket and the other part is connected to the structural bonding points.

The installation shall be done as follows:

- Locate the Structural Bonding Point referenced to in the applicable Integration Sign-off sheets (see example in ANNEX C: ); the locations of these bonding points on the structure are provided in the applicable ICD.
- Attach the structural bonding lead parts to their corresponding Bonding Point.
- Torque bolt with 0,8 Nm + running torque.
- If the Structural Bonding Point does not provide a self-locking thread then fix the Screw head/Nut by a point of adhesive (e.g. EC2216 or appropriate) to the structure.
- Fix the routing with patches of plain Kapton tape (1 inch x 1 inch), taking care, that this routing does not cross over detachable parts of the structure.

The structural reference for each blanket bonding point is given in the applicable Integration Sign-off sheets (see example in ANNEX C: )

#### 8.1.6 Punching of Stand-Off Holes into the Blankets/Foils

Put the relevant template onto a clean table. Punch the marked holes into the template by using a hollow punch, which is 1 mm larger in diameter than the S/O shaft. Attach the template to the Spacecraft again and verify, that the holes match the S/Os.

Repeat para. 8.1.4 if necessary to obtain correct template fit.





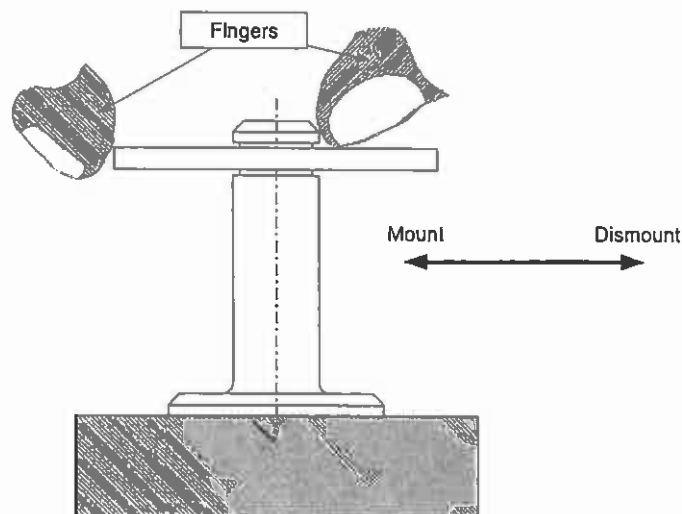
When template fits to the Spacecraft/Instrument, unpack the blanket bearing the same Part Number as the template (compare Part Number on Marking Tag with number on template) and put it onto the working surface. Apply the template with the correctly punched S/O holes on the blanket and align with the most important geometrical shape (i.e. Cutout, Outer Envelope). Mark S/O positions with the cleanroom approved pen.

*Note: Before punching the S/O holes, verify the proper condition of the hollow punch. The hollow punches' cutting edge must be without any cracks or burrs. For an optimum punching result the punch must be sharpened frequently and several spare tools should be available.*

Punch the S/O holes using a hollow punch, which is 1 mm larger in diameter than the S/O shaft.

### 8.1.7 Attachment of Clip Washers

The Clip Washers must be applied very carefully to avoid undue force on the S/O's. Clip-Washers shall be applied as shown in the following figure:



**Figure 8-2: Clip Washer Attachment**

All Clip Washers shall be applied such, that the Blankets nicely fit to the structure – i.e. the blankets shall neither be compressed nor have a gap to the structure larger than necessary.



### 8.1.8 Attachment of Blankets and Foils to the Structure

The attachment of the blankets to the structure is a very delicate process und should therefore be performed by experienced personnel (or at least under supervision of experienced personnel) and very carefully.

Apply a blanket to the structure and adjust to its contour where necessary. Apply Clip-Washer as described in para. 8.1.7 above. If clearance between thermal blankets/foils and the structure is required, Clip-Washers can be attached on the S/Os underneath the blankets (Some S/Os have several grooves) to hold the blankets in position.

Removal of a Blanket is the reverse procedure.

Note: Before removal of a blanket verify,

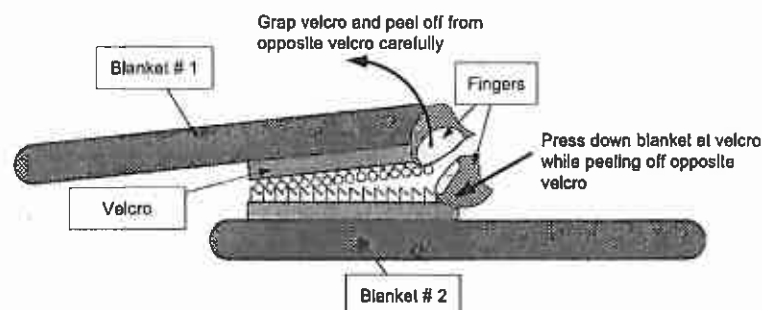
- that all overlaps are free
- all Clip-Washers have been removed
- all bonding leads have been disconnected
- all layers of the blanket have been detached from the stand-offs

so to avoid damage of the blanket. This process could require the removal of another blanket first before removing the intended blanket.

#### 8.1.8.1 Opening of Velcros

When opening blanket overlaps, which are closed by means of velcros, the following procedure has to be strictly followed in order to avoid any damage on the interfacing blankets (see Figure 8-3).

- ⇒ grasp the first part of the velcro connection (either hook or loop part)
- ⇒ press down the opposite part of the velcro connection and peel the connection apart carefully.
- ⇒ **ATTENTION:** Never open the connection by pulling on either part of the blanket, but always peel the parts apart by grasping both parts of the velcros!!



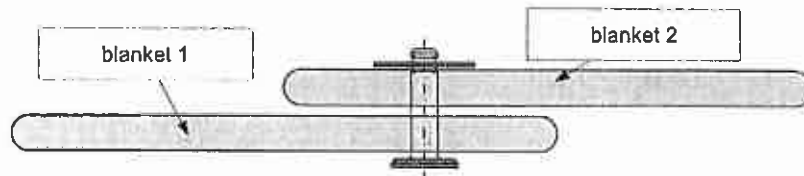
**Figure 8-3: Opening of Velcros**



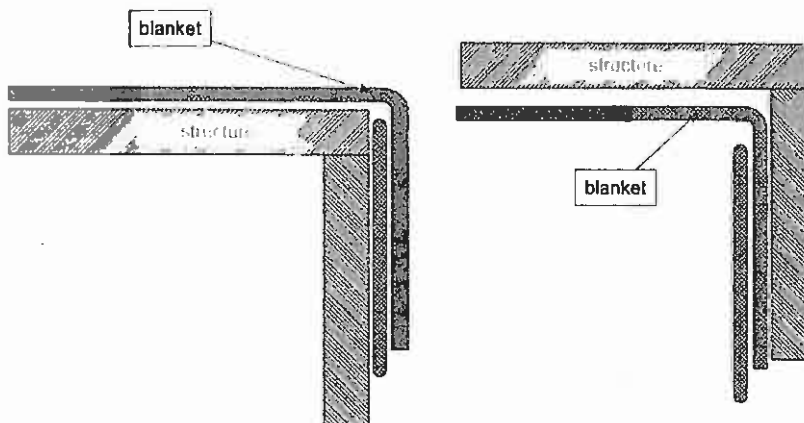
### 8.1.9 Overlapping Rules

If not otherwise defined in and thus superseded by the relevant project specific instructions, the following overlapping rules apply:

The standard overlap design is the "single" overlap as shown in Figure 8-4. Overlapping of 3 and more MLI has the same principle as overlapping with 2 MLI.



**Figure 8-4: Single Overlap**

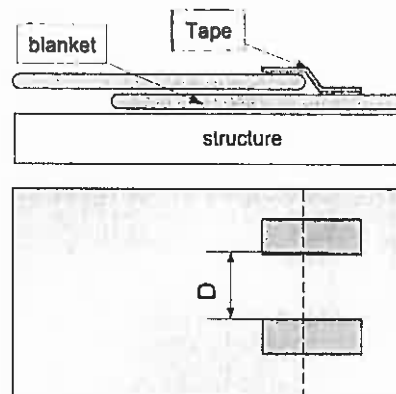


**Figure 8-5: Overlapping at Corners**



### 8.1.10 Closure of Blanket Overlaps

If seen necessary during final inspection, some blanket overlaps shall be partially closed to avoid additional thermal losses (see Figure 8-6).



**Figure 8-6: Closing of Blanket Overlaps using Tapes**

Note: If no other distance "D" is specified for the individual case in the respective special instructions for each blanket, then this distance shall be 150 mm

The typical size of the tape is 50 x 25 mm.

The tape to be used shall be made of outer layer material except stated otherwise in the special instructions



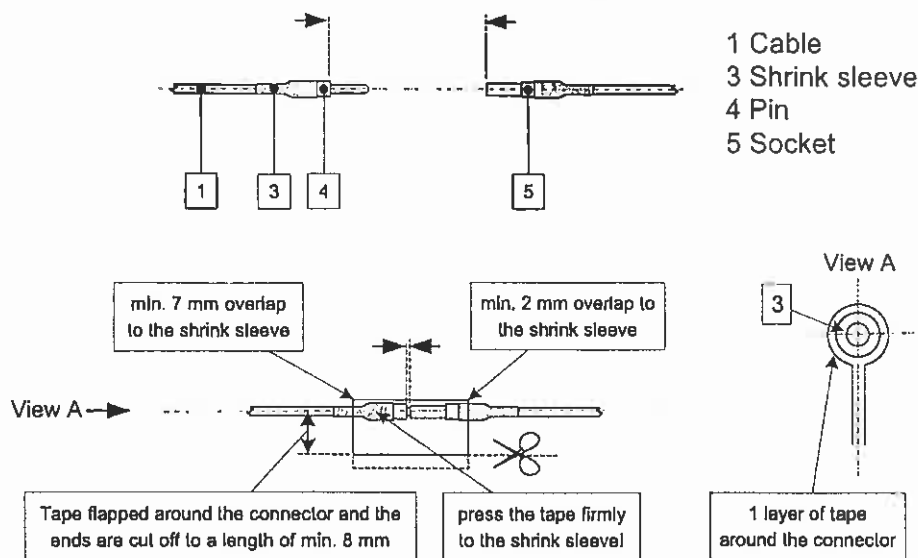
### 8.1.11 Connection of Bonding Leads

One Bonding Lead set consists of two pieces. One part is riveted to the blanket while the other part is attached to the respective structural bonding point.

After performing the tasks of para. 8.1.5 the structural parts of the bonding leads are ready for mating of blanket part/structural part of the bonding lead. After connection of all bonding leads of the MLI blanket, the electrical resistance between the rivet of one bonding point and its structural reference shall be measured and recorded.

*Note: Before flight, this Pin/Socket connection must be secured against accidental demating with a piece of 1 mil plain Kapton 966 or 9460 PSA tape, wound around the connector (see Figure 8-7).*

Securing of connectors with 1mil Kapton / PSA Tape (25,4 x 25,4 mm):



**Figure 8-7: Securing of bonding lead connections**



### 8.1.12 Open Work

A number of cut-outs, slits etc. might have to be made during integration (this is stated as "open work" in the relevant delivery documents respectively in the detailed instructions).

The general proceeding is as described in para. 8 above (i.e. taking the relevant contours, slits etc. onto the template and then introducing them into the blanket/foil).

*Note: All information given in para. 8.2 have to be taken into account.*

This work is to be performed by AAE personnel or at least in presence of an AAE representative to ensure that the same manufacturing standards/methods are applied that were used during the production of this hardware.

### 8.1.13 Documentation

As the stand-off locations on the templates are only indicating the approximate position, the actual position has only to be clearly marked on the reduced size template copies when it is more than 10 mm away from its nominal position.

The final stand-off position has always to be marked on the template used for on-site modification of the blanket (see para. 8.1.6)

All other modifications of the hardware (slits, cut-outs, tapes etc.) must be clearly marked on the production templates provided together with the blankets as well as on the reduced size copies of the templates, which are provided with the applicable delivery documents.

All hardware items modified during integration (e.g. by making cut-outs, finishing bonding leads etc.) shall be weighed. The new weight shall be recorded in the relevant inspection record of the blanket (i.e. column "Mass" respectively column "Remarks").

For each MLI blanket / foil the electrical resistance between the rivet of one bonding point and its structural reference shall be checked/measured for compliance to the applicable requirement and recorded in the applicable Integration Sign-off sheets (see example in ANNEX C: )

Each mounting/removal of an MLI blanket has to be documented in the „Historical Record" sheet of the relevant delivery documents.



## 8.2 SPECIFIC INSTRUCTIONS

Any instructions, which are specific to a project will be provided in detailed instructions, which shall be considered as an amendment to this generic procedure and which are to be part of the delivery documentation.

These detailed instructions will include

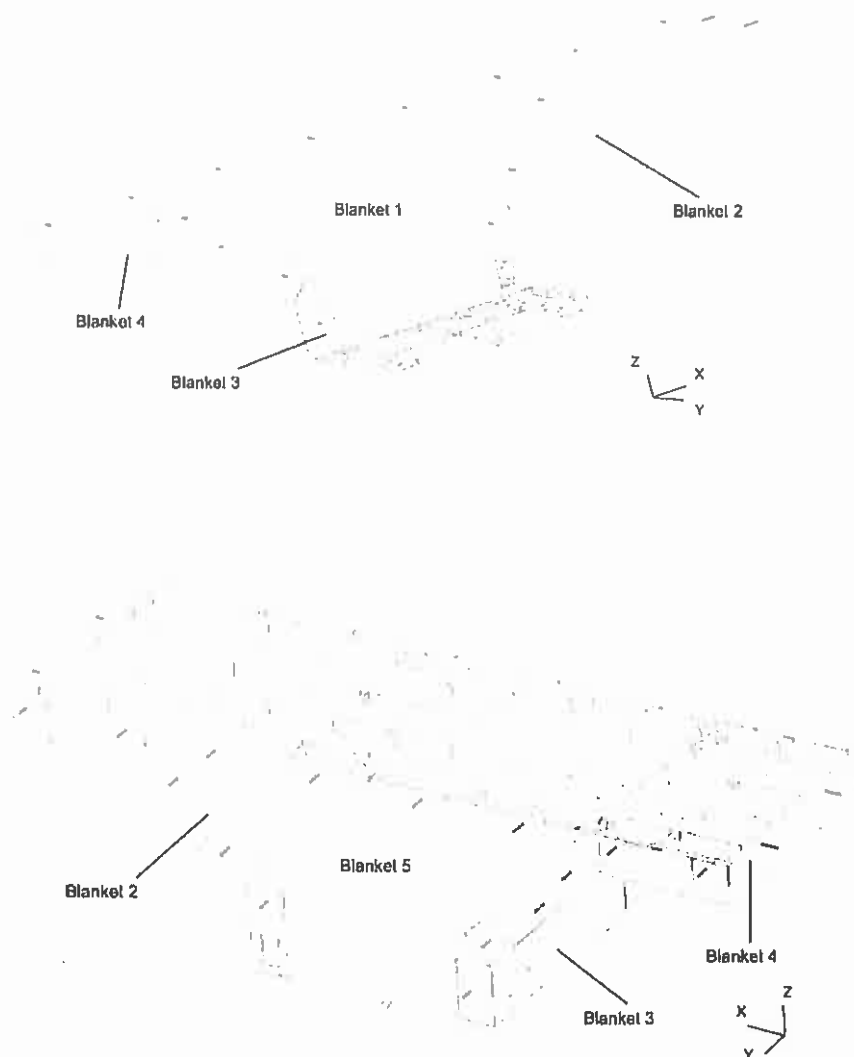
- 1 Special instructions for integration, if any applicable to the project. These special instructions shall clearly identify and describe

- ⇒ Special integration sequence: any sequence of blanket mounting or dismounting to be especially observed during blanket integration
- ⇒ Special overlapping rules: any overlapping rules, which have to be especially considered and are not described either in para. 8.1.8.1 above or in the applicable General Arrangement drawings.
- ⇒ Special integration requirements: any measures which have to be especially considered.

2. Bonding instructions for attachment bonding (according ANNEX B: )
3. Any Open Work referring to para. 8.1.12 above (according ANNEX D: )
4. General Arrangement Drawing for the MLI blankets (example see ANNEX A: )
5. Blanket Integration Sign-off Sheets (according ANNEX C: )
6. List of hardware to be integrated (according ANNEX E: )



**ANNEX A: GENERAL ARRANGEMENT DRAWING (EXAMPLE)**



**Figure 8-8: Example for General Arrangement Drawing**



**ANNEX B: BONDING INSTRUCTIONS**

Different adhesives and applicable procedures might be used for bonding of different types of attachments.

In case that AAE is responsible for the bonding of the attachments, the definition of the adhesives and the applicable procedures to be used has to be included in the applicable detailed instructions, which are contained in the relevant sections of the delivery documents.

The tables / forms as shown hereafter shall be used in the applicable detailed instructions.

ADHESIVE	FORESEEN USE	APPLICATION PROCEDURE
SUBSTRATE	SUBSTRATE PREPARATION	SUBSTRATE CLEANING

**Table 8-1: Form for Bonding Instructions**

ADHESIVE	FORESEEN USE	APPLICATION PROCEDURE
Scotchweld EC 2216 B/A	Bonding of Stand-offs	QSTD-MPRC-3008-AAE
SUBSTRATE	SUBSTRATE PREPARATION	SUBSTRATE CLEANING
CFRP	to be roughended by means of a glass-fibre pencil. <i>Note: In case of CFRP substrate the grinding must be performed carefully, not to damage the CFRP fibres. This abrasion shall only give a good bonding surface and is not intended to achieve any "electrical" contact.</i>	Clean the surface, where the Stand-off will be bonded to and the foot of the Stand-off with Acetone and disposable cleaning paper a second time.
Aluminium	Aluminium substrates need not to be abraded if the surface treatment provides a proper bonding surface (to be checked on case-by-case basis).	same as for CFRP



For each adhesive batch used an "Adhesive Mixture Record" as shown below has to be filled

<b>ADHESIVE MIXTURE RECORD</b>		No. (JJ / MM / DD / No.):      /      /      /	
Adhesive (Part A):		Color:	
Adhesive (Part B):		Color:	
Lot No. (Part A):			
Lot No. (Part B):			
AAE-Ref. (Part A): Colli:		; EoL	
AAE-Ref. (Part B): Colli:		; EoL	
Project-Code:		Reference Doc.:	
Mixture Ratio by Weight:		Part A : Part B =	
Used balance (type, S/N):		; next cal.:	
Part A:	nominal:	g	actual: g
K = 1 / Mixture Ratio			
Part B:	nominal: ( $A_{act} \times K =$ )	g	actual: g
Time / Start:		Mixture Duration: min.	
Temperature: ° C		Humidity: % r. H.	
Pot Life:		Time of Last Bonding:	
Minimum Cure Time at room-temperature:			
Cure-Time before Loading (Cure at 25° C):			
Bonding Samples: according to:			
Required: 1 pcs.		actual: pcs	
Samples marked with Record No. and Sample-Serial No.: performed by _____			
Remarks:			
Location:	Date:	Performed by:	Checked by:

**Table 8-2: Form for Adhesive Mixture Record**



ADHESIVE MIXTURE RECORD		No. (JJ / MM / DD / No.): 05 / 03 / 08 / 01	
Adhesive (Part A): SCOTCH-WELD 2216 A		Color: grey	
Adhesive (Part B): SCOTCH-WELD 2216 B		Color: white	
Lot No. (Part A): 16 99 65			
Lot No. (Part B): 16 99 65			
AAE-Ref. (Part A): Colli: 2728		; EoL: 19. 10. 06	
AAE-Ref. (Part B): Colli: 2728		; EoL: 19. 10. 06	
Project-Code: SMOS		Reference Doc.: SO-UM-AAE-TCSH-0001	
Mixture Ratio by Weight:		Part A : Part B = 7 : 5	
Used balance (type, S/N): KERN CM 320-1		; next cal.: 28. 09. 05	
Part A: nominal: 7 g		actual: 7,5 g	
$K = 1 / \text{Mixture Ratio} = 5 / 7 = 0,714$			
Part B: nominal: ( $A_{\text{act}} \times K =$ ) 5 g		actual: 5,4 g	
Time / Start: 15:15		Mixture Duration: 5 min.	
Temperature: 22 °C		Humidity: RR % r. H.	
Pot Life: max. 90 min.		Time of Last Bonding: 15:40	
Minimum Cure Time at room-temperature: 6 h			
Cure-Time before Loading (Cure at 25° C): 24 h			
Bonding Samples: according to:			
Required: 1 pcs.		actual: 1 pcs	
Samples marked with Record No. and Sample-Serial No.: performed by KOK			
Remarks:			
Location: AAE		Date: 08. 03. 05	Performed by: KOK
			Checked by: KOK

**ANNEX C: INTEGRATION SIGN-OFF SHEETS**

Several Integration steps have to be performed up to final integration of the blankets.

The general definition of the different steps of integration is applicable for all blankets and is therefore defined herein.

The definition of the blankets is project specific and has to be included in the applicable detailed instructions, which are contained in the relevant sections of the delivery documents.

The tables / forms as shown hereafter shall be used in the applicable detailed instructions.

Blanket ID	Blanket Name Blanket No. / Issue	S/N	INTEGRATION STEPS										REMARKS
-1	Name Number/Issue	SN	§1 Attachments	S/O	C/W	floating S/O							
			Mounting										
			§2 Bonding leads	SGP ID	rouled	Structure S/N	Blanket S/N	length	Connect	Secure	Resist		
			Blanket BP1										
			Blanket BP2										
			§3 Blanket	fit-check	modified	holes	initial	overlap prelim.	overlap final	open work			
	Integration												

**Table 8-3: Form for Integration Sign-off Sheet**

Each entry in the integration sign-off sheet is explained hereafter for better understanding. An example of an integration sign-off sheet is provided hereafter as well.

**§ 1 „Attachments Mounting“**

"S/O"	to be signed-off, when all stand-offs have been properly mounted to their supports according to instructions in the integration procedure
"floating"	to be signed-off, when all floating Stand-offs for the respective blanket have been mounted
"C/W"	to be signed-off, when the respective blanket has been finally integrated and it has been checked, that all clipwashers are mounted

**§ 2 „Bonding Leads“**

"SGP ID"	when the structure-side bonding lead for the blanket has been properly mounted to the structural grounding point, the unique structural grounding point ID (according applicable ICD) has to be filled-in for each blanket bonding point separately.
"routed"	to be signed-off, when the bonding lead has been properly routed on the structure for connection with its counterpart on the blanket
"Structure S/N"	the serial number printed on the shrink sleeve at connector side of the bonding lead connected to the structural grounding point has to be recorded
"Blanket S/N"	the serial number printed on the shrink sleeve at connector side of the bonding lead mounted on the blanket has to be recorded
"length"	the length of the bonding lead used for mounting on structural grounding point has to be recorded
"Connect"	to be signed-off, when the bonding lead has been initially connected with its corresponding structural counterpart
"Secure"	to be signed-off, when the bonding lead has been finally connected with its corresponding structural counterpart and secured
"Resist."	the electrical resistance between the rivet of the bonding point and its structural reference shall be checked/measured for compliance to the applicable requirement and recorded
	This can either be a "YES/NO" measurement, which is confirmed by a ✓ or a measurement value pending the requirement.



**§ 3 „Blanket Integration“**

“fit-check”	to be signed-off, when the corresponding blanket template has been fit-checked and modified, if needed, for a proper fit of the respective blanket.
“modified”	to be signed-off, when all modifications according the „open work“ section, which are related to blanket modification, and all other necessary modifications for a proper fit of the respective blanket have been performed
“holes”	to be signed-off, when all holes for Stand-offs have been punched into the respective blanket
“Initial”	to be signed-off, when the respective blanket has been initially integrated and found to fit properly
“overlap prelim.”	For thermal or mechanical tests overlaps shall be closed as less as possible to fulfill its function, but to allow the removal of the Blanket without damage. To be signed-off, when when closure of overlaps has been performed acc. instructions in the detailed integration procedure for this purpose.
“overlap final”	For launch overlaps shall be closed as necessary to fulfill its function. After the final closure of the MLJ Blankets, the removal (without damage) is very difficult. To be signed-off, when closure of overlaps has been performed acc. instructions in the detailed integration procedure
“open work”	to be signed-off, when all remaining open work according „open work“ section, which is <u>not</u> related to blanket modification, (e.g. removal of protective layer) have been performed

The columns, which are left blank may be used for additional steps, which are seen necessary during integration.

The “REMARKS” column shall be used for any additional information considered necessary to be recorded (e.g. NCR number, etc.)



ID	Blanket Name Blanket No. / Issue	S/N	INTEGRATION STEPS										REMARKS
-1	Blanket Front G3990-301-001-00/B	01	\$1 Attachments	S/O	C/W	floating S/O							
			Mounting	✓	✓	✓							
			\$2 Bonding leads	SGP ID	routed	Structure S/N	Blanket S/N	length	Connect	Secure	Resist.		
			Blanket BP1	SGP01	✓	1234	4568	800	✓	✓	0.20 Ω		
			Blanket BP2	SGP02	✓	2536	1254	900	✓	✓	0.15 Ω		
			\$3 Blanket	fil-check	modified	holes	initial	overlap prelim.	overlap final	open work			
			Integration	✓	✓	✓	✓	✓	✓	✓			
-2	Blanket Skirt Right G3990-301-002-00/B	01	\$1 Attachments	S/O	C/W	floating S/O							
			Mounting	✓	✓	✓							
			\$2 Bonding leads	SGP ID	routed	Structure S/N	Blanket S/N	length	Connect	Secure	Resist.		
			Blanket BP1	SGP02	✓	2358	7923	800	✓	✓	✓		
			Blanket BP2	SGP03	✓	4789	1278	400	✓	✓	✓		
			\$3 Blanket	fil-check	modified	holes	initial	overlap prelim.	overlap final	open work			
			Integration	✓	✓	✓	✓	✓	✓	✓			



**ANNEX D: OPEN WORK LIST**

A number of cut-outs, slits etc. might have to be made during integration.

The definition of the open work tasks to be performed is project specific and has to be included in the applicable detailed instructions, which are contained in the relevant sections of the delivery documents.

The tables / forms as shown hereafter shall be used in the applicable detailed instructions.

Seq No.	Nomenclature	Drawing-/ Identification No.	Open		Reference Documents	Close-Out	
			Test	Work		Date	Sign
1							
2							

**Table 8-4: Form for Open Work Definition**





Seq No.	Nomenclature	Drawing-/ Identification No.	Open		Reference Documents	Close-Out	
			Test	Work		Date	Sign
1	Cut-outs for Feedhorn brackets to be adjusted after final adjustment of feedhorns.	G2820-400-000-11; S/N 03		x	SAR-AAE-MA-1001 iss. 2.0		
2	Protective Mylar cover to be removed prior to test	G2820-500-000-61. S/N 03		x	SAR-AAE-MA-100X iss. 1.0		
3							
4							
5							
6							
7							
8							

**ANNEX E: LIST OF HARDWARE TO BE INTEGRATED**

The definition is project specific and has to be established for each individual project separately.

The tables / forms as shown hereafter shall be used for definition of the hardware.

The filled-in tables / forms have to be included in the applicable detailed instructions, which are contained in the relevant sections of the delivery documents.

An example of such a definition / listing is provided hereafter as well.

**Blankets/Foils**

<i>pcs.</i>	<i>Description</i>	<i>Part No.</i>	<i>S/N</i>	<i>Remarks</i>

**Attachment Hardware**

<i>pcs.</i>	<i>Description</i>	<i>Part No.</i>	<i>Remarks</i>

**Grounding Hardware**

<i>pcs.</i>	<i>Description</i>	<i>Part No.</i>	<i>Remarks</i>

**Blankets/Foils**

pcs.	Description	Part No.	S/N	Remarks
1	Blanket Front	G3990-301-001-00/B	01	
1	Blanket Skirt Right	G3990-301-002-00/B	01	
1	Blanket Skirt Left	G3990-301-003-00/B	01	
1	Blanket Feedhorn Top	G3990-301-004-00/A	01	
1	Blanket Feedhorn Lower	G3990-301-005-00/A	01	
1	Blanket Subreflector	G3990-301-006-00/A	01	
1	Blanket Tower Lower	G3990-301-007-00/B	01	
1	Blanket Tower Upper	G3990-301-008-00/A	01	
1	Blanket Bracket Left	G3990-301-009-00/A	01	
1	Blanket Bracket Right	G3990-301-010-00/A	01	
1	Blanket Bracket Left Corner	G3990-301-011-00/A	01	
1	Blanket Bracket Right Corner	G3990-301-012-00/A	01	
1	Blanket Bracket Front	G3990-301-013-00/A	01	
1	Blanket Bracket Front	G3990-301-013-00/A	01	

**Attachment Hardware**

pcs.	Description	Part No.	Remarks
13	Stand-off Ø4-5	G1390-250-100-00/a	
26	Stand-off Ø4-9.5	G1390-250-300-00/a	
64	Clipwasher Ø4/Ø15	SKQ-V10220/Rev.1	

**Grounding Hardware**

pcs.	Description	Part No.	Remarks
22	Bonding Lead (l=800 mm), Typ 02	BL0800TS-T02	structural part
6	Bonding Lead (l=900 mm), Typ 02	BL0900TS-T02	structural part

## **Ammendments to Generic Procedure QSTD-MPRC-3054-AAE**

### **3.1 INTEGRATION STEPS FOR THERMAL HARDWARE**

#### **3.1.1 Attachments**

- A marking for the attachment (Stand-off / Velcro) positions have to be done by using the bonding template or the bonding drawing.
- Clean the attachment bonding area by using isopropyl alcohol.
- The attachment bonding area has to be abraded by using abrading fleece, sand paper or a glass fibre pen depending on the surface - see paragraph 3.3.
- After the abrading the attachment bonding area has to be cleaned by using isopropyl alcohol.
- Start the bonding of the attachments after a minimum of 10 minutes after cleaning.
- The bonded attachments have to be fixed with flash braker tape during the curing if necessary.

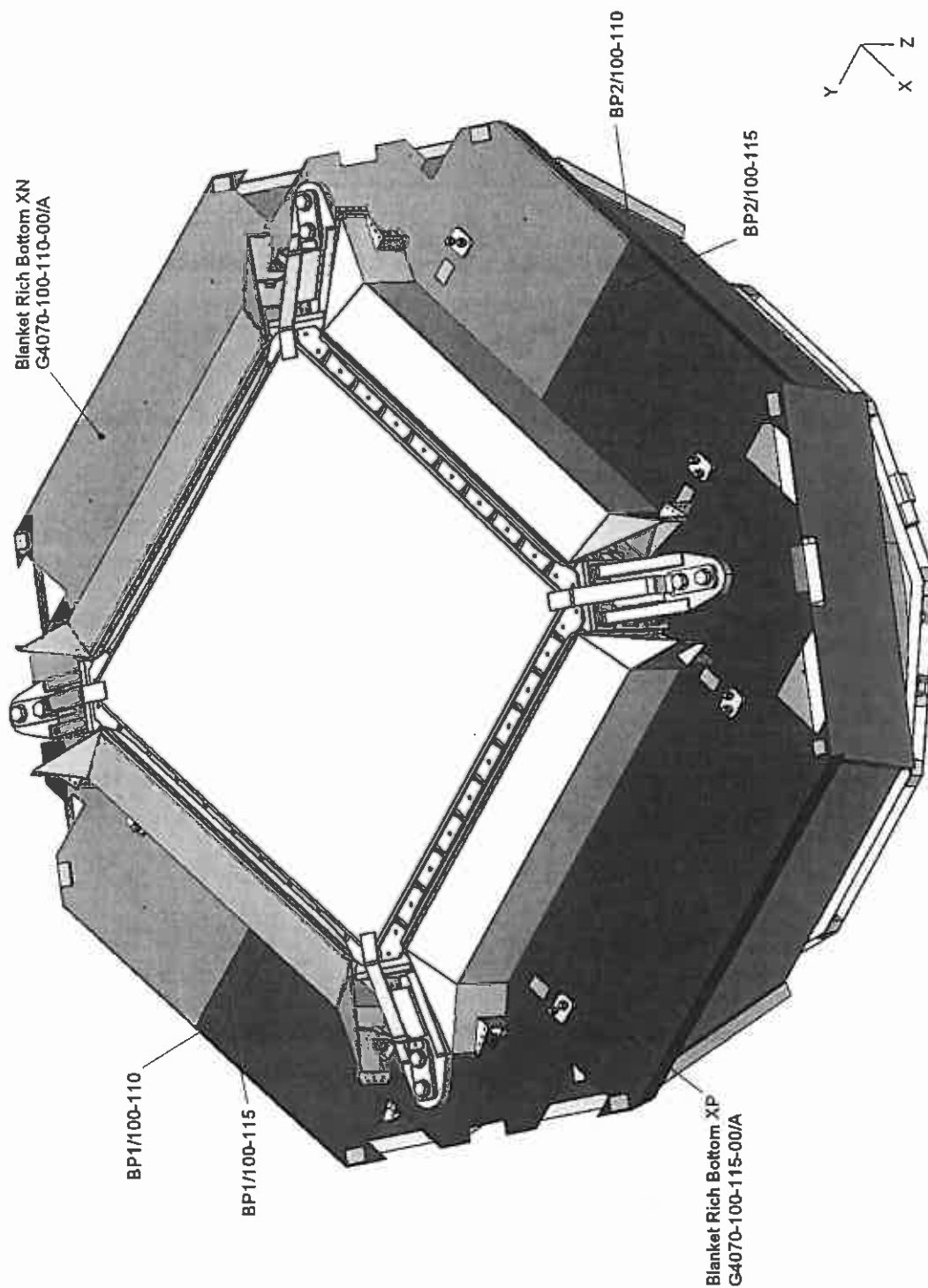
#### **3.1.2 Grounding**

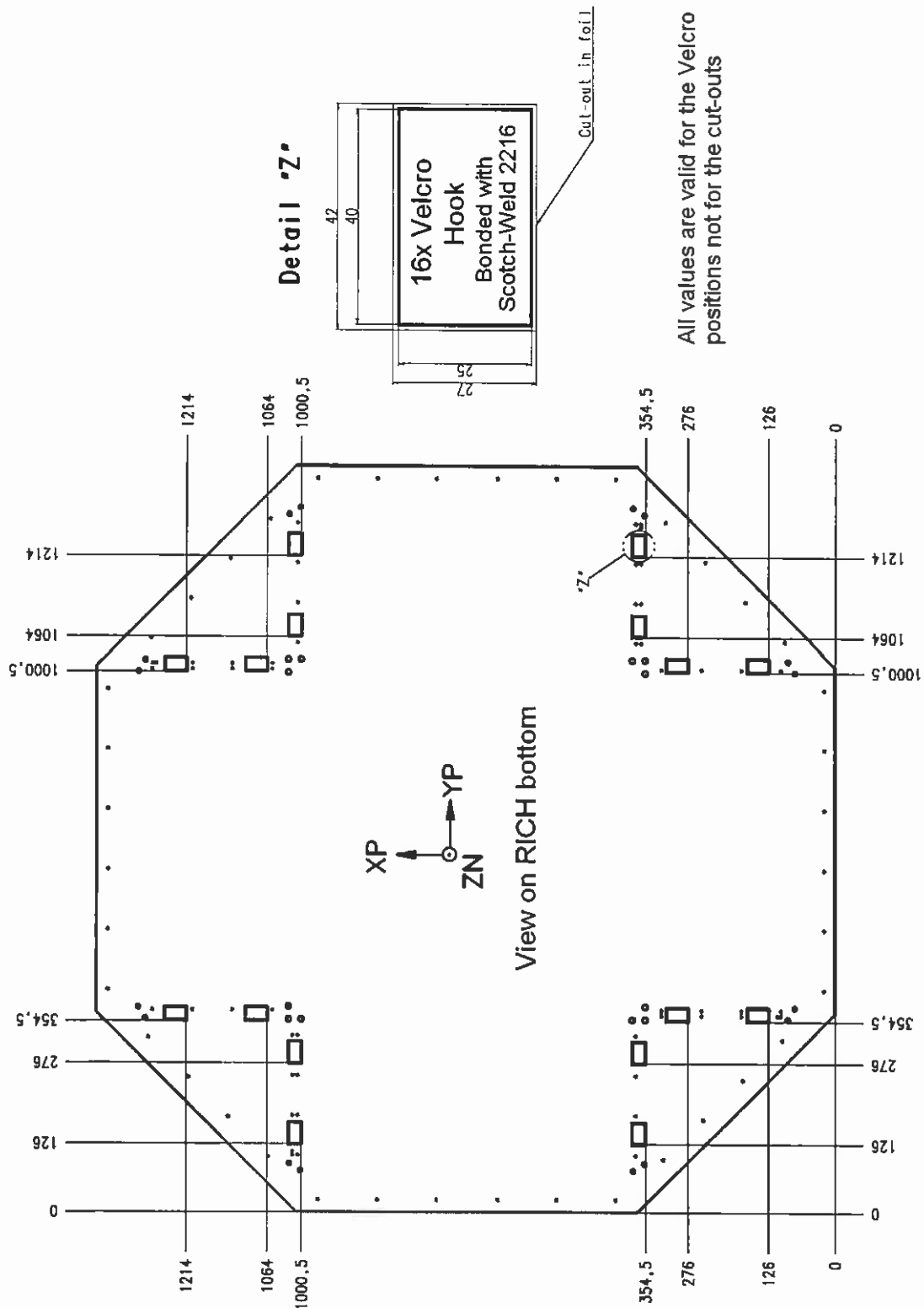
- The structural bonding leads have to be routed and fixed by Kapton tape.
- Fix the structural bonding leads to the structural grounding point.

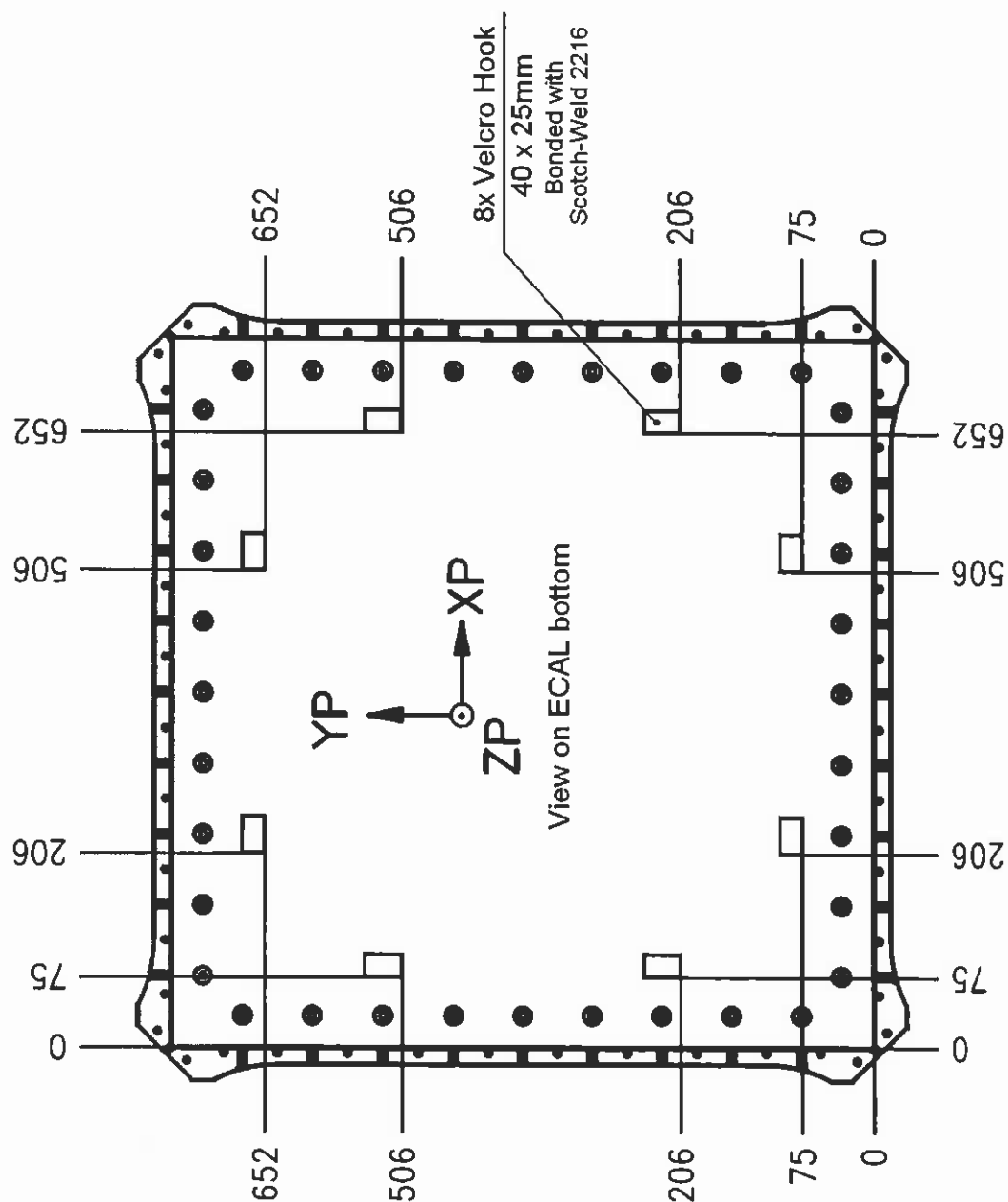
#### **3.1.3 Thermal Hardware**

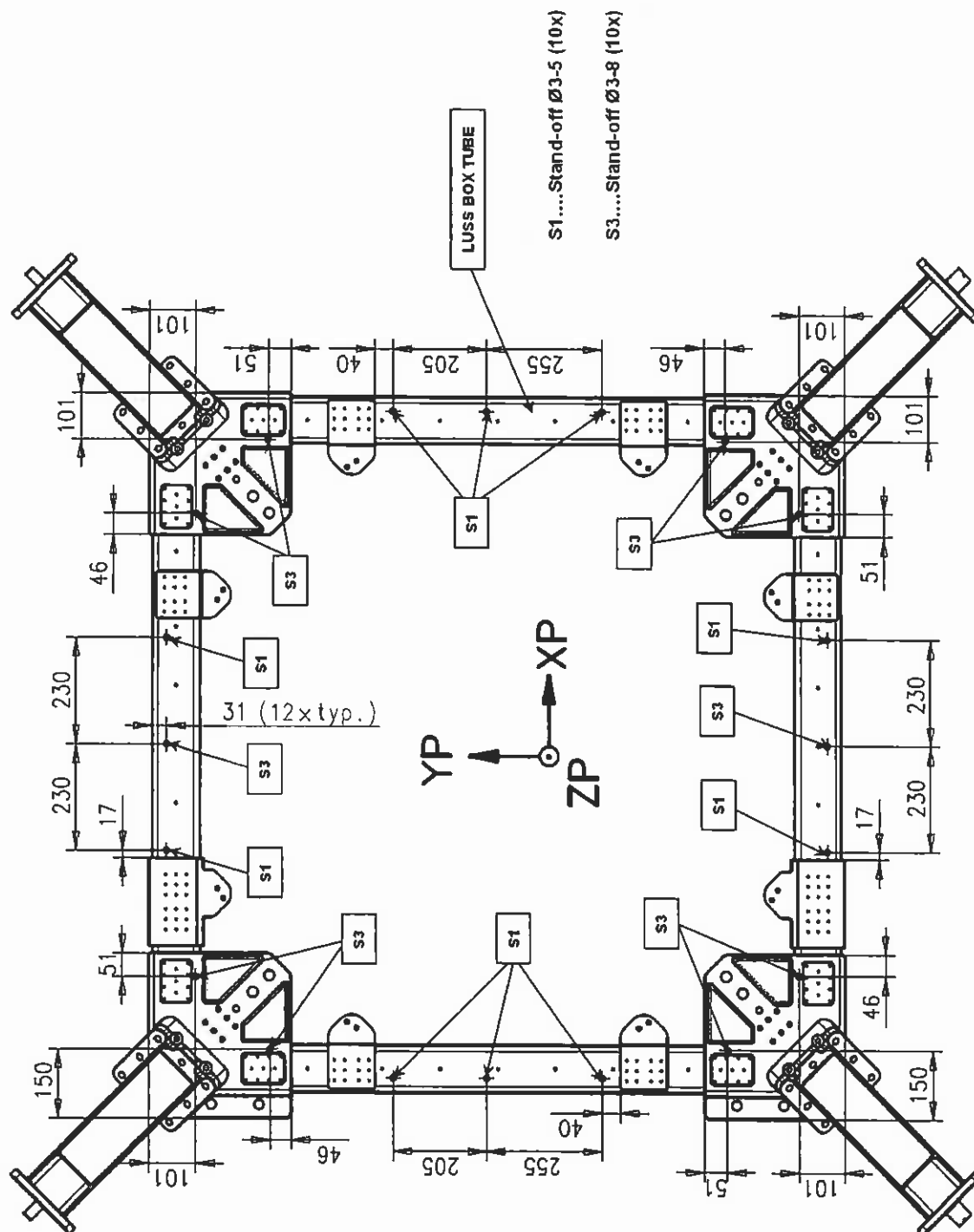
- The thermal hardware (MLI / SLI) have to be removed carefully from the polyethylene bag and the protective clear Mylar foil.
- A fit check has to be done by using the manufacturing or the fit check template.
- The stand-off holes have to be punched in the blanket according the positions of the fit check template.
- Integration of thermal hardware.
- During the integration the structural bonding leads and the blanket bonding leads have to be connected and secured.
- Fill in the sign-off sheets accordingly.

## 3.2 GENERAL ARRANGEMENT DRAWINGS











**3.3 BONDING INSTRUCTIONS**

ADHESIVE	FORESEEN USE	APPLICATION PROCEDURE
Scotchweld EC 2216 B/A	Bonding of Stand-offs / Velcros	QSTD-MPRC-3008-AAE
SUBSTRATE	SUBSTRATE PREPARATION	SUBSTRATE CLEANING
CFRP	to be roughended by means of a glass-fibre pencil. <i>Note: In case of CFRP substrate the grinding must be performed carefully, not to damage the CFRP fibres. This abrasion shall only give a good bonding surface and is not intended to achieve any "electrical" contact.</i>	Clean the surface, where the Stand-off / Velcro will be bonded to and the foot of the Stand-off with Acetone and disposable cleaning paper a second time.
Aluminium	The surface treatment on aluminium substrates has to be removed by sandpaper ( Alodine, Alclad, Anodize).	same as for CFRP



# Scotch-Weld™

## Epoxy Adhesive

2216 B/A Gray • 2216 B/A Tan NS • 2216 B/A Translucent

### Technical Data

May, 1998

(Supersedes March 1, 1995)

**Product Description** 3M™ Scotch-Weld™ 2216 B/A Gray, Tan NS and Translucent Epoxy Adhesives are flexible, two-part, room temperature curing epoxies with high peel and shear strengths.

#### Features

- Excellent for bonding many metals and woods, most plastics and rubbers and masonry products.
- 2216 B/A Gray Adhesive meets MIL-A-82720.
- 2216 B/A Tan NS Adhesive provides a non-sag product for greater bondline control.

#### Typical Uncured Physical Properties

Note: The following technical information and data should be considered representative or typical only and should not be used for specification purposes.

Product	2216 B/A Gray		2216 B/A Tan NS		2216 B/A Translucent	
	Base	Accelerator	Base	Accelerator	Base	Accelerator
Color:	White	Gray	White	Tan	Translucent	Amber
Base:	Modified Epoxy	Modified Amine	Modified Epoxy	Modified Amine	Modified Epoxy	Modified Amine
Net WL: (lbs.gal.)	11.1-11.6	10.5-11.0	11.1-11.6	10.5-11.0	9.4-9.8	8.0-8.5
Viscosity: (cps) (Approx.) Brookfield RVF #7 sp. @ 20 rpm	75,000 - 150,000	40,000 - 80,000	75,000 - 150,000	*40 - 80	11,000 - 15,000	5,000 - 9,000
Mix Ratio: (by weight)	5 parts	7 parts	5 parts	7 parts	1 part	1 part
Mix Ratio: (by volume)	2 parts	3 parts	2 parts	3 parts	1 part	1 part
Work Life: (Approx. Time for 100 Gra Qly. @ 75°F (24°C)	90 minutes	90 minutes	120 minutes	120 minutes	120 minutes	120 minutes

\*Press Flow (sec.) 20 grams or 20g, 50 psl, 80°F, 0.104 in. orifice.

# Scotch-Weld™

## Epoxy Adhesives

2216 B/A Gray • 2216 B/A Tan NS • 2216 B/A Translucent

### Typical Cured Physical Properties

Product	2216 Gray	2216 Tan NS	2216 Translucent
Color	Gray	Tan	Translucent
Shore D Hardness ASTM D 2240	50-65	65-70	35-50
Time to Handling Strength	8-12 hrs.	8-12 hrs.	12-16 hrs.

### Typical Cured Electrical Properties

Product	2216 Gray	2216 Translucent
Arc Resistance	130 seconds	
Dielectric Strength	408 volts/mil	630 volts/mil
Dielectric Constant@73°F (23°C)	5.51—Measured @ 1.00 KC	
Dielectric Constant@140°F (60°C)	14.17—Measured @ 1.00 KC	
Dissipation Factor 73°F (23°C)	0.112 Measured @ 1.00 KC	
Dissipation Factor 140°F (60°C)	0.422—Measured @ 1.00 KC	
Surface Resistivity@73°F (23°C)	5.5 x 10 <sup>16</sup> ohms—@ 500 volts DC	
Volume Resistivity@73°F (23°C)	1.9 x 10 <sup>12</sup> ohms-cm—@ 500 volts DC	3.0 x 10 <sup>12</sup> ohms-cm @ 500 volts DC

### Typical Cured Thermal Properties

Product	2216 Gray	2216 Translucent
Thermal Conductivity	0.228 Blu-ft/l <sup>2</sup> h°F	0.114 Blu-ft/l <sup>2</sup> h°F
Coefficient of Thermal Expansion	102 x 10 <sup>-6</sup> in./in./°C between 0-40°C 134 x 10 <sup>-6</sup> in./in./°C between 40-80°C	81 x 10 <sup>-6</sup> in./in./°C between -50-0°C 207 x 10 <sup>-6</sup> in./in./°C between 60-150°C

### Handling/Curing Information

#### Directions for Use

1. For high strength structural bonds, paint, oxide films, oils, dust, mold release agents and all other surface contaminants must be completely removed. However, the amount of surface preparation directly depends on the required bond strength and the environmental aging resistance desired by user. For suggested surface preparations of common substrates, see the following section on Surface Preparation.
2. These products consist of two parts. Mix thoroughly by weight or volume in the proportions specified on the Product Label and in the Uncured Properties Section. Mix approximately 15 seconds after a uniform color is obtained.
3. For maximum bond strength apply product evenly to both surfaces to be joined.
4. Application to the substrates should be made within 90 minutes. Larger quantities and/or higher temperatures will reduce this working time.
5. Join the adhesive coated surfaces and allow to cure at 60°F (16°C) or above until firm. Heat, up to 200°F (93°C), will speed curing.

# Scotch-Weld™

## Epoxy Adhesives

2216 B/A Gray • 2216 B/A Tan NS • 2216 B/A Translucent

### Handling/Curing Information (continued)

6. The following times and temperatures will result in a full cure:

Product	2216 Gray	2216 Tan NS	2216 Translucent
Cure Temperature	Time	Time	Time
75°F (24°C)	7 days	7 days	30 days
150°F (66°C)	120 minutes	120 minutes	240 minutes
200°F (93°C)	30 minutes	30 minutes	60 minutes

7. Keep parts from moving until handling strength is reached. Contact pressure is necessary. Maximum shear strength is obtained with a 3-5 mil bond line.

8. Excess uncured adhesive can be cleaned up with ketone type solvents.\*

Adhesive Coverage: A 0.005 in. thick bondline will typically yield a coverage of 320 sq. ft./gallon

### Application and Equipment Suggestions

These products may be applied by spatula, trowel or flow equipment.

Two-part mixing/proportioning/dispensing equipment is available for intermittent or production line use. These systems are ideal because of their variable shot size and flow rate characteristics and are adaptable to many applications.

### Surface Preparation

For high strength structural bonds, paint, oxide films, oils, dust, mold release agents and all other surface contaminants must be completely removed. However, the amount of surface preparation directly depends on the required bond strength and the environmental aging resistance desired by user.

The following cleaning methods are suggested for common surfaces.

#### Steel

1. Wipe free of dust with oil-free solvent such as acetone or alcohol solvents.\*
2. Sandblast or abrade using clean fine grit abrasives (180 grit or finer).
3. Wipe again with solvents to remove loose particles.
4. If a primer is used, it should be applied within 4 hours after surface preparation. If Scotch-Weld 1945 B/A two-part primer is used, apply a thin coating (0.0005 in.) on the metal surfaces to be bonded, air dry for 10 minutes, then cure for 30 minutes at 180°F (82°C) prior to bonding.

#### Aluminum

1. Vapor Degrease – Perchloroethylene condensing vapors for 5-10 minutes.
2. Alkaline Degrease – Oakite 164 solution (9-11 oz./gallon water) at 190°F ± 10°F (88°C ± 5°C) for 10-20 minutes. Rinse immediately in large quantities of cold running water.

\*Note: When using solvents, extinguish all ignition sources and follow the manufacturer's precautions and directions for use.

# Scotch-Weld™

## Epoxy Adhesives

2216 B/A Gray • 2216 B/A Tan NS • 2216 B/A Translucent

### Surface Preparation (continued)

3. Acid Etch – Place panels in the following solution for 10 minutes at  $150^{\circ}\text{F} \pm 5^{\circ}\text{F}$  ( $66^{\circ}\text{C} \pm 2^{\circ}\text{C}$ ).

Sodium Dichromate	4.1 - 4.9 oz./gallon
Sulfuric Acid, 66°Be	38.5 o 41.5 oz./gallon
2024-T3 aluminum (dissolved)	0.2 oz./gallon minimum
Tap Water	Balance of volume

4. Rinse: Rinse panels in clear running tap water.
5. Dry: Air dry 15 minutes; force dry 10 minutes at  $150^{\circ}\text{F} \pm 10^{\circ}\text{F}$  ( $66^{\circ}\text{C} \pm 5^{\circ}\text{C}$ ).
6. If primer is to be used, it should be applied within 4 hours after surface preparation.

### Plastics/Rubber

1. Wipe with isopropyl alcohol.\*
2. Abrade using fine grit abrasives (180 grit or finer).
3. Wipe with isopropyl alcohol.\*

### Glass

1. Solvent wipe surface using acetone or MEK.\*
2. Apply a thin coating (0.0001 in. or less) of Scotch-Weld EC-3901 Primer to the glass surfaces to be bonded and allow the primer to dry a minimum of 30 min. @  $75^{\circ}\text{F}$  ( $24^{\circ}\text{C}$ ) before bonding.

\*Note: When using solvents, extinguish all ignition sources and follow the manufacturer's precautions and directions for use.

### Typical Adhesive Performance Characteristics

#### A. Typical Overlap Shear Strength (PSI) ASTM D-1002-64

Test Temperature	Overlap Shear (psi) @ $75^{\circ}\text{F}$ ( $24^{\circ}\text{C}$ )		
	2216 B/A Gray Adhesive	2216 B/A Tan NS Adhesive	2216 B/A Trans. Adhesive
-67°F	2000	2000	3000
75°F ( $24^{\circ}\text{C}$ )	2500	2500	2500
180°F ( $82^{\circ}\text{C}$ )	400	400	140

#### B. Typical T-Peel Strength (PIW) ASTM D-1876-61T

Test Temperature	T-Peel Strength (piw) @ $75^{\circ}\text{F}$ ( $24^{\circ}\text{C}$ )		
	2216 B/A Gray Adhesive	2216 B/A Tan NS Adhesive	2216 B/A Trans. Adhesive
75°F ( $24^{\circ}\text{C}$ )	25	25	25

# Scotch-Weld™

## Epoxy Adhesives

2216 B/A Gray • 2216 B/A Tan NS • 2216 B/A Translucent

Typical Adhesive  
Performance  
Characteristics  
(continued)

### C. Overlap Shear Strength After Environmental Aging Etched Aluminum

Environment	Time	Overlap Shear (psi) 75°F (24°C)		
		2216 B/A Gray Adhesive	2216 B/A Tan NS Adhesive	2216 B/A Trans. Adhesive
100% Relative Humidity @ 120°F (49°C)	14 days 30 days 90 days	2950 psi 1985 psi 1505 psi	3400 psi 2650 psi	1390 psi
**Salt Spray@75°F (24°C)	14 days 30 days 60 days	2300 psi 500 psi 300 psi	3900 psi 3300 psi	1260 psi
Tap Water@75°F (24°C)	14 days 30 days 90 days	3120 psi 2942 psi 2075 psi	3250 psi 3700 psi	1950 psi
Air@160°F (71°C)	35 days	4650 psi	4425 psi	
Air@300°F (149°C)	8 days	4000 psi	4450 psi	3500 psi
Anti-icing Fluid@75°F (24°C)	7 days	3300 psi	3050 psi	2500 psi
Hydraulic Oil@75°F (24°C)	30 days	2500 psi	3500 psi	2500 psi
JP-4 Fuel	30 days	2500 psi	2750 psi	2500 psi
Hydrocarbon Fluid	7 days	3300 psi	3100 psi	3000 psi

### D. Overlap Shear Strength on Abraded Metals, Plastics, and Rubbers.

Overlap shear strengths were measured on 1 in. wide 1/2 in. overlap specimens. These bonds were made individually using 1 in. by 4 in. pieces of substrate (Tests per ASTM D-1002-72).

The thickness of the substrates were: cold rolled, galvanized and stainless steel – 0.056-0.062 in., copper – 0.032 in., brass – 0.036 in., rubbers – 0.125 in., plastics – 0.125 in.. All surfaces were prepared by solvent wiping/abrading/ solvent wiping.

The jaw separation rate used for testing was 0.1 in. per minute for metals, 2 in. per minute for plastics, and 20 in. per minute for rubbers.

Substrate	Overlap Shear (PSI)@75°F (24°C)	
	2216 B/A Gray Adhesive	2216 B/A Tan NS Adhesive
Aluminum/Aluminum	1850	2350
Cold Rolled Steel/Cold Rolled Steel	1700	3100
Stainless Steel/Stainless Steel	1900	
Galvanized Steel/Galvanized Steel	1800	
Copper/Copper	1050	
Brass/Brass	850	
Styrene Butadiene Rubber/Steel	200*	
Neoprene Rubber/Steel	220*	
ABS/ABS Plastic	990*	1140*
PVC/PVC, Rigid	940*	
Polycarbonate/Polycarbonate	1170*	1730*
Acrylic/Acrylic	1100*	1110*
Fiber Reinforced Polyester/ Reinforced Polyester	1660*	1650*

\*The substrate failed during the test.

\*\*Salt spray results are affected by substrate corrosion which results in adhesive failure.

# Scotch-Weld™

## Epoxy Adhesives

2216 B/A Gray • 2216 B/A Tan NS • 2216 B/A Translucent

### Storage and Shelf Life

**Storage:** Store products at 60-80°F (16-27°C) for maximum storage life.

**Shelf Life:** When stored at the recommended temperatures in the original, unopened containers, these products have a shelf life of two years from date of shipment.

### Precautionary Information

Refer to Product Label and Material Safety Data Sheet for Health and Safety Information before using the product.

### For Additional Information

To request additional product information or to arrange for sales assistance, call toll free 1-800-362-3550. Address correspondence to: 3M Adhesives Division, 3M Center, Building 220-7E-05, St. Paul, MN 55144-1000. Our fax number is 612-733-9175. In Canada, phone: 1-800-364-3577. In Puerto Rico, phone: 1-809-750-3000. In Mexico, phone: 5-728-2180.

### Important Notice

3M MAKES NO WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. User is responsible for determining whether the 3M product is fit for a particular purpose and suitable for user's method of application. Please remember that many factors can affect the use and performance of a 3M Adhesives Division product in a particular application. The materials to be bonded with the product, the surface preparation of those materials, the product selected for use, the conditions in which the product is used, and the time and environmental conditions in which the product is expected to perform are among the many factors that can affect the use and performance of a 3M product. Given the variety of factors that can affect the use and performance of a 3M product, some of which are uniquely within the user's knowledge and control, it is essential that the user evaluate the 3M product to determine whether it is fit for a particular purpose and suitable for the user's method of application.

### Limitation of Remedies and Liability

If the 3M product is proved to be defective, THE EXCLUSIVE REMEDY, AT 3M'S OPTION, SHALL BE TO REFUND THE PURCHASE PRICE OF OR TO REPAIR OR REPLACE THE DEFECTIVE 3M PRODUCT. 3M shall not otherwise be liable for loss or damages, whether direct, indirect, special, incidental, or consequential, regardless of the legal theory asserted, including negligence, warranty, or strict liability.

ISO 9002

This Adhesives Division product was manufactured under a 3M quality system registered to ISO 9002 standards.

For Additional Product Safety and Health Information, See Material Safety Data Sheet, or call:

**3M**

#### Adhesives Division

3M Center, Building 220-7E-05  
St. Paul, MN 55144-1000  
Phone: 1-800-364-3577 or 612-737-6501



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<b>ADHESIVE</b>	<b>MIXTURE</b>	No. (JJ / MM / DD / No.):      /      /      /	
Adhesive (Part A):	SCOTCH-WELD 2216 A	Color: <b>grey</b>	
Adhesive (Part B):	SCOTCH-WELD 2216 B	Color: <b>white</b>	
AAE-Ref. (Part A):	Colli:	EoL:	
AAE-Ref. (Part B):	Colli:	EoL:	
Project Code:		Reference Doc.:	
Mixture Ratio (by weight):		Part A : Part B = 7 : 5	
Used balance (IDNr.):		; next cal.:	
Part A: nominal (7 g ± 2g):	g	actual:	g
Part B: nominal: ( $A_{act} \times 5 : 7 =$ )	g	actual:	g
Environment: Cleanroom <input type="checkbox"/> / Non-Cleanroom <input type="checkbox"/> Temp.:      ° C / Humidity:      % r. H.			
Time / Start:		Homogeneity of mixture: <input type="checkbox"/> (mixture duration: >10 minutes)	
Time of Last Bonding:		Pot Life: max. 90 min. <input type="checkbox"/>	
Minimum Cure Time at room-temperature:		8 h	
Cure-Time before Loading (Cure at 25° C):		24 h	
Bonding Samples: prepared according to procedure <input type="checkbox"/>			
Structure samples available <input type="checkbox"/> alternative Aluminium <input type="checkbox"/>			
Samples and remaining adhesive mixture marked with Record No. and Proj. No.: performed by _____			
Bonded Items (ref. to General Arrangement):			
Remarks:			
Location:		Performed by:	

<b>Bonding-Verification</b> with spring-balance (> 1kg) at 5% of bonded S/O	
Quantity of checked Stand-Offs:	Quantity of failed Stand-Offs:
Remaining Mixture got hard: <input type="checkbox"/>	Checked by:      Date/Time:



## 3.4 INTEGRATION SIGN-OFF SHEETS

ID	Blanket Name Blanket No. / issue	S/N	INTEGRATION STEPS										REMARKS		
			\$1 Attachments	S/O	C/W	floating S/O									
-1	Blanket Rich Bottom XN G4070-100-110-00	01	Mounting												
			\$2 Bonding leads												
			Blanket BP1												
			Blanket BP2												
			\$3 Blanket												
	Integration														

# Austrian Aerospace

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Issue: 2.0

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ID	Blanket Name Blanket No. / issue	S/N	INTEGRATION STEPS										REMARKS
			\$1 Attachments	S/O	C/W	floating S/O							
-2	Blanket Rich Bottom XP G4070-100-115-00	01	Mounting										
			\$2 Bonding leads	SGP ID	routed	Structure S/N	Blanket S/N	length	Connect	Secure	Resist		
			Blanket BP1										
			Blanket BP2										
			\$3 Blanket	fit- check	modified	holes	initial	overlap prelim.	overlap final	open work			
			Integration										

## 3.5 OPEN WORK

### 3.5.1 Removal of Silver FEP tape on LUSS

The LUSS is partially covered by Silver FEP tape. This tape has to be removed locally to bond the stand-offs by proceeding the following steps:

- Cut out the Silver FEP tape by using a scalpel. Positions acc. ANNEX 3.6; Diameter: 11mm
- Remove remainders of PSA by using a scalpel.
- Clean the open area by using isopropyl-alcohol.
- Abreading the surface of the open area by using Scotchbrite or sandpaper.
- Clean the open area by using isopropyl-alcohol again and wait a minimum of 10 minutes before starting the bonding.
- Bonding the stand-offs and make sure that the glue covers the open area between the stand-off flange and the tape.

### 3.5.2 Further open work

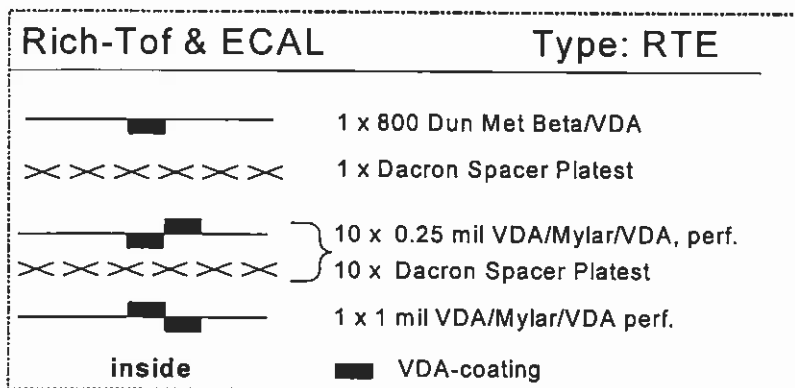
Seq No.	Nomenclature	Drawing-/ Identification No.	Open		Reference Documents	Close-Out	
			Test	Work		Date	Sign
1							
2							
3							

### 3.6 LIST OF HARDWARE TO BE INTEGRATED

#### Thermal Hardware

<i>Pcs.</i>	<i>Description</i>	<i>Drawing</i>	<i>SN</i>	<i>Remarks</i>
1	Blanket Rich Bottom XN	G4070-100-110-00/A	01	PFM
1	Blanket Rich Bottom XP	G4070-100-115-00/A	01	PFM

#### Lay-up



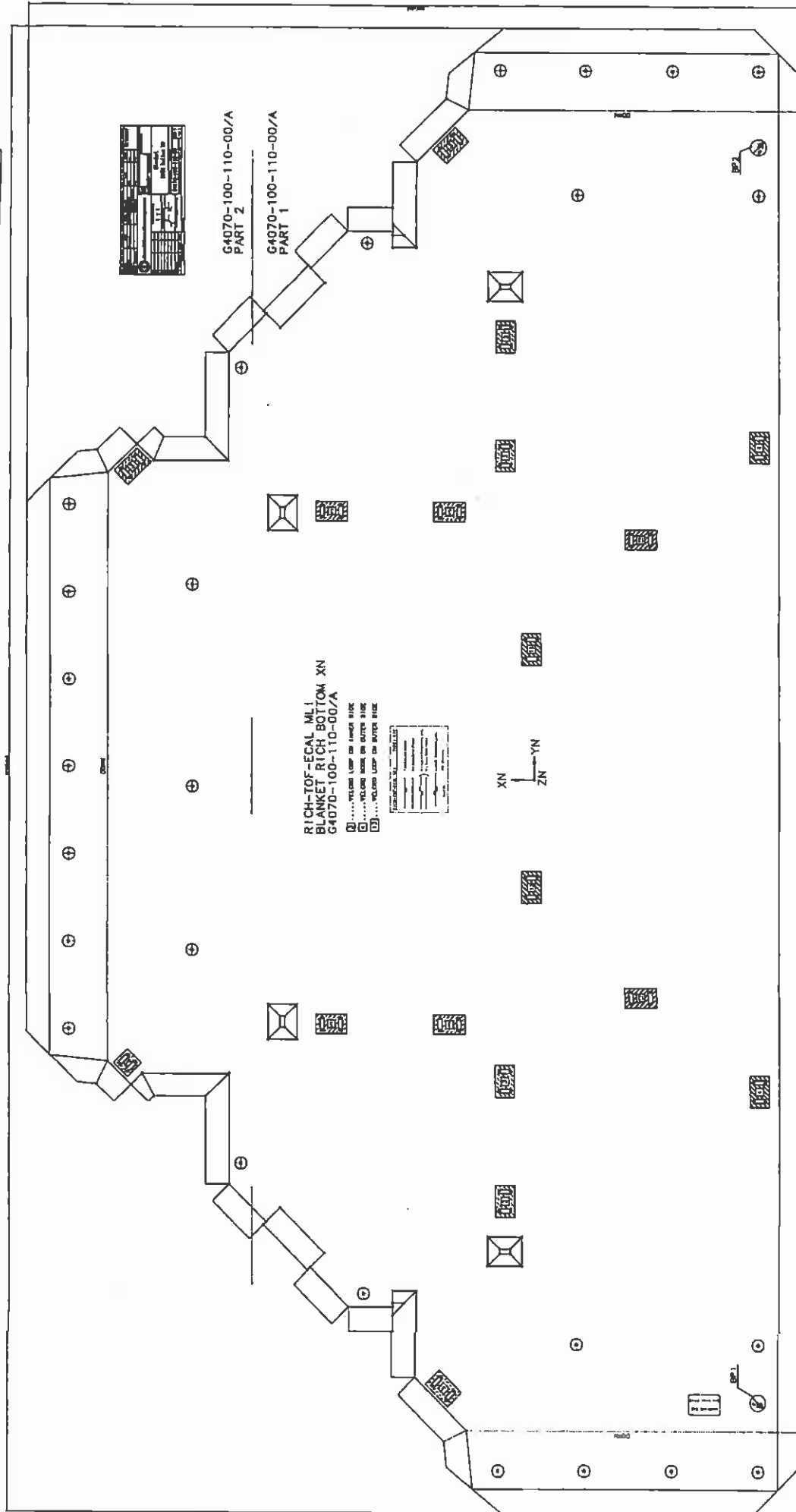
#### Attachment Hardware

<i>Pcs.</i>	<i>Description</i>	<i>Drawing</i>	<i>Colli</i>	<i>Remarks</i>
10	Stand-off Ø3-5	G300-409-000-00/A	3038	
10	Stand-off Ø3-8	G300-410-000-00/A	3036	
20	Clipwasher Ø3/ Ø11	SKQ-V10165/Rev.1	1470	
24	Velcro Hook 085		-	25x40mm

## **3.7 REDUCED SIZE TEMPLATE DRAWINGS**

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off. issue A

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## **4. AAE ACCEPTANCE TEST REPORTS**



**ANHANG D: BLANKET INSPECTION SHEETS**

The following Inspection steps have to be performed prior to releasing the respective frame for packing and delivery to the customer

**§ 11 „JobCards filled“:**

Check if all steps in the JobCards have been properly performed an signed off by the manufacturing responsible

**§ 12 „Marking Tag“:**

Check of correct position of the Marking Tag and correct references on the Marking Tag

**§ 13 „Lay-up“:**

Check of correct blanket lay-up by inspection of the lay-up sample of the package used for manufacturing of the respective blanket. The reference number of the lay-up sample may be added in this column too.

**§ 14 „Conformance with Design“:**

Check if the respective blanket has been manufactured in accordance with the respective template and all additional instructions provided in the JobCards

**§ 15 „Cleanliness“:**

Check of required cleanliness level (Requirement: „visual clean“)

**§ 16 „Resistance Measurements“:**

The following resistance measurements have to be performed

- I. resistance between one pair of opposite grounding points
- II. resistance between VDA surface of Betacloth and one grounding point

**§ 17 „Further processing“:**

Release of blanket for packing

**„Mass“:**

The mass of the respective blanket has to be weighed and recorded in this column

JC Page	Inspection Steps		S/N Model	S11 (JobCards filled)	S12 (Marking Tag)	S13 (Lay-up)	S14 (Conformance)	S15 (Cleanliness)	S16 (Resistance Measurements) I) opposite Pins II) Surface to Grounding point	S17 (Further Processing)	Mass (g)	Date	QA sign.	Remarks
	Blanket Name	Blanket No./Issue												
A.2	Blanket Rich Bottom XN G4070-100-110-00/A		01 PFM	✓	✓	68/07	✓	✓	I) Pins: 0,2 Ω II) VDA: 4,1 KΩ	✓	650	11/9/07	AAE PA-08	
A.3	Blanket Rich Bottom XP G4070-100-120-00/A		01 PFM	✓	✓	68/07	✓	✓	I) Pins: 0,2 Ω II) VDA: 3,8 KΩ	✓	648	11/9/07	AAE PA-08	
	115													

## **5. HISTORICAL RECORDS**

## HISTORICAL RECORD DATA SHEET

Item: Blanket Rich Bottom XN			Dwg.-No.: G4070-100-110-00		Issue: A	Model: PFM	Serial No.: 01
Company	Date	Event	Event Description	Remark / Report	Sign		
AAE	Start: 09/2007 End: 09/2007	MANUFACTURE and INSPECTION	Manufacturing of Blanket and Blanket Inspection	acc. RTEM-TLS-0001-AAE	/iss. 1.0	see blanket inspection sheets	
AAE	Start: End:	INTEGRATION	Initial Integration of Blanket	acc. RTEM_DP_0001_A AE Section 3	/iss. 1.0	see integration sign-off sheets	
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## **6. OTHER INFORMATION / DOCUMENTS**